Paris ISO/CCITT Meeting - Synopsis of Code Table Changes

O. Miles
860-WI

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TELEPHONE
AREA CODE 201
949-3000

X3.2/380
May 19, 1966

MAY - 9 1966

MEMBERS ASA X3.2 AND ASSOCIATED TASK GROUPS:

I have taken the liberty of issuing this synoptic report of the April, 1966 meetings of ISO/TC 97/SC 2 and CCITT GM/ALP, in advance of a more complete report from John Auwaerter, as certain matters are of especially urgent importance to our group.

SC2 and GM/ALP unanimously accepted a number of changes to the previous ISO 7-bit code table. In summary, they are:

1. Grave accent was moved from 4/0 to 6/0.
2. Commercial at, as a preferred symbol in a national usage position, was moved from 6/0 to 4/0.
3. Position 2/4, formerly CS1 (national usage) is now assigned to $. It is understood that this does not mean "dollars" or "dollars US" except through the use of appropriate conventions or in the appropriate context.
4. Position 2/3, formerly #, is now assigned to £ with # as an alternative for those countries so desiring. Again, £ does not mean "pounds sterling" etc.
5. Position 5/12, formerly CS2 (national usage) is now merely an open national usage position.
6. Overline has been assigned to position 7/14, and can serve as "tilde" or other lesser-used accents much as "quotes" serves as "diaeresis". It is expected that many countries may wish to suggest a graphic stylization to enhance this usage.

CBI 64/1/23

7. Positions 5/15, 6/0, and 7/14 are now given a "contingent" national use status: they may be pre-empted for national use by those countries needing more than the 7 ordinary national usage positions (4/0, 5/11, 5/12, 5/13, 7/11, 7/12, 7/13).

8. SS has been removed from position 1/10 and in that position is assigned:

   SUB (Substitute) - A character used to replace a character which is invalid or erroneous.

   It was generally understood that this assignment would in no way deprecate the practice of using a graphic character as a substitute when this appeared most appropriate. The character SUB merely provides a tool for those systems or parts of systems needing an unambiguous substitute character.

It seems almost inevitable that these changes will receive final approval in both ISO and CCITT. I therefore strongly recommend that we undertake a commensurate revision to ASCII in the most expeditious manner. Since the changes above do not provide a complete character set (5/12 and 7/12 remain unspecified), I make the following proposal:

1. Adopt changes described above (insofar as applicable to a national code). Elect option of retaining # in 2/3.

2. Assign vertical rule to 7/12 and reverse slant to 5/12. This in effect restores the proposal for revision of ASCII which was under consideration before the entry of tilde into the picture.

I am preparing draft revisions to the Appendices to correctly reflect the ISO changes.

I look forward to treating this matter at the May 17 - 19 meetings of X3.2.4 and X3.2.

D. A. KERR
Member X3.2

Draft Proposed Revised ASCII

17 May 66

BELL TELEPHONE LABORATORIES
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TELEPHONE
AREA CODE 201
949-3000

X3.2.4/158.
May 12, 1966

TO MEMBERS ASA X3.2.4:

As a follow-up to the proposal made in my letter of May 9, 1966, the attached is a draft complete proposal for a (second) revision of the American Standard Code for Information Interchange. It differs from the first revision, ASA X3.4-1965, only in the following respects:

1. Changes are made to bring the code table into conformity with the results of the ISO/TC 97/SC 2 - CCITT GM/ALP meeting of April 26-28, in Paris.
2. A compatible set of other changes to the code table are made to make the table complete and consistent subsequent to the results of Item 1.
3. Necessary changes pursuant to the above are made in the appendices.

As few people have (thank goodness) seen X3.4-1965, the attached proposal uses the standard and appendices of X3.2/206 as a base document, indicating changes from it. The changes are of two distinct categories:

1. The numbered items are editorial corrections to 263 X3.2/206 which were initially forwarded in X3.2/~~283~~, and which were incorporated in X3.2-1965. Not all the items of /263 appear here, as some are superseded by the new material described below. All items retain their numbers from /263, and are presented here verbatim except for correction of errors which appeared in /263(!). ~~283~~ 283
2. The lettered items convey the substance of the current proposal, or, in a few cases, cover additional errors found in /206 subsequent to the issuance of /283. 263

CB1 81/20/1

It should be noted that several of its provisions restore agreements which were previously reached by our group but were subsequently disturbed by the emergence of the "Tilde problem". Further, the reverse slant, which I propose for reinstatement to position 5/12, was widely implemented pursuant to X3.2-1963 and found very useful by many people.

D. A. KERR
Member X3.2.4

Att.
As above

X3.2.4/

DRAFT

May 12, 1966
D.A. Kerr

PROPOSED REVISED AMERICAN STANDARD
CODE FOR INFORMATION INTERCHANGE

Base document: X3.2/206, January 21, 1965, standard and Appendices A - D.

Numbered changes originally promulgated by X3.2/~~263~~, 283 September 2, 1965

1. Page 1: Par 3, line 3, following error control, the punctuation is a comma.

2. Page 2: Show current X3.2 membership.

3. Page 3: Show appropriate X3.2.4 membership list.

a. Page 6: See attached new code table.

b. Page 7: Last paragraph, line 2, change alternately to alternatively.

4. Page 7: Last paragraph, line 4, add the between and and decimal.

c. Page 8: Strike SS Start...

Replace by:

SUB Substitute

d. Page 8: After DEL Delete replace the asterisk by [1] Same with note at bottom.

e. Page 9, 10: Replace all single asterisks with [2].
Replace all double asterisks with [3].

f. Page 9, 10: Replace items with numbers below as shown:

2/3	#	[3]Number sign
2/4	$	Dollar sign (Note deleted- ed.)
4/0	@	[3]Commercial At
5/12	\	[3]Reverse Slant
6/0	`	[3]Grave Accent[2] (Opening Single Quotation Mark)
7/12	|	[3]Vertical Line
7/14	~	[3]Overline (Tilde[2]; General Accent[2])

g. Page 10: First text paragraph: replace in entirety by:

[2]The use of the symbols in positions 2/2, 2/7, 2/12, 5/14, 6/0, and 7/14 as diacritical marks is described in Appendix A, paragraphs A5.2 and A5.3.

h. Page 10: Second text paragraph: replace double asterisk by [3].

5. Page 11: Section 5.2; change affected entries as follows:

NUL (Null): The all....

BEL (Bell): A character....

i. Page 13: Paragraph "SS"; replace in entirety with:

SUB (Substitute): A character that may be used to replace a character which is determined to be invalid or in error, ~~erroneous~~.

j. Page 17: Paragraph A5.2, line 2; change two to one.
change marks to mark
change have to has

line 3; change four to five

k. Page 18: Table; remove entries 6/0 and 5/12.
Add entries as follows, in proper order:

6/0	‘	Opening Single Quotation Mark	Grave Accent
7/14	~	Overline	Tilde*

* May also be used for other accents not specifically provided.

l. Page 18: Delete present paragraph A5.3
Renumber paragraph A5.4 as A5.3
Replace its last sentence by:

The wave in its code table representation is shown to suggest a means of avoiding confusion with underline, and to enhance its use as tilde.

6. Page 18: Section A6.1, line 2; change simple to simply.

7. Page 18: Section A6.3, line 2; change thereby to there be.

m. Page 19: Paragraph A6.6; replace in entirety by:

A6.6 The assignment of reverse slant and vertical line, of the brackets and the braces, and of circumflex and overline were made to minimize difficulties when using a 64-graphic device as described above.

8. Page 19: Section A6.10, line 3; add a comma after ("Fieldata" - 1961)

9. Page 20: Line 2, add commas after (these) symbols and slant.

10. Page 20: Section A7.3, line 1; last word is of.

n. (Replaces 11)
Page 24: Section B4, line 2; transpose Telephone and Telegraph

Second sentence; replace by:

It includes all the character assignments specified for international standardization by those bodies.

Last sentence; replace by:

Their recommendations, however, are expected to permit national standardization by the various countries in seven code table positions, with three "supplementary" positions available for national standardization by those countries having an extraordinary requirement for national characters. These "national usage" positions and their assignments in this standard are shown below, with the "supplementary" positions indicated by an asterisk:

Table; delete entry 2/4; change entries as follows:

4/0		@
5/12		\
5/14	*	^
6/0	*	`
7/12		|
7/14	*	~

o. (Replaces 12)
Page 25: first line; change 11 to 10.

Second paragraph; replace by:

> In addition, in many countries number sign ("#", position 2/3) may be replaced by "£".

DRAFT

2. STANDARD CODE

Bits b7 b6 b5 →					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	Column → Row ↓	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	*SUB*	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	−	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

X3.2/

X3.2.4/ 165

(ADVANCE MANUSCRIPT)

X3.2.4/ 163

May 18, 1966

X3.2/375

PROPOSED REVISED AMERICAN STANDARD

CODE FOR INFORMATION INTERCHANGE

Base document: X3.2/206, January 21, 1965, standard and Appendices A - D.

Numbered changes originally promulgated by X3.2/263, September 2, 1965

Document X3.2.4/164 shows effect of these changes

1. Page 1: Par 3, line 3, following error control, the punctuation is a comma.

2. Page 2: Show current X3.2 membership.

3. Page 3: Show appropriate X3.2.4 membership list.

a. Page 6: See attached new code table.

b. Page 7: Last paragraph, line 2, change alternately to alternatively.

4. Page 7: Last paragraph, line 4, add the between and and decimal.

c. Page 8: Strike SS Start...

Replace by:

SUB Substitute

d. Page 8: After DEL Delete replace the asterisk by ^{1} Same with note at bottom.

e. Page 9, 10: Replace all single asterisks with ^{2}.
Replace all double asterisks with ^{3}.

f. Page 9, 10: Replace items with numbers below as shown:

2/3	#	^{3}Number sign
2/4	$	Dollar sign (Note deleted- ed.)
4/0	@	^{3}Commercial At
5/12	\	^{3}Reverse Slant
6/0	`	^{3}Grave Accent^{2} (Opening Single Quotation Mar
7/12	|	^{3}Vertical Line
7/14	‾	^{3}Overline (Tilde^{2}; General Accent^{2})

CBI 67/2/12

g. Page 10: First text paragraph: replace in entirety by:
[2]The use of the symbols in positions 2/2, 2/7, 2/12, 5/14, 6/0, and 7/14 as diacritical marks is described in Appendix A, paragraphs A5.2 and A5.3.

h. Page 10: Second text paragraph: replace double asterisk by [3].

5. Page 11: Section 5.2; change affected entries as follows:
<u>NUL (Null)</u>: The all....
<u>BEL (Bell)</u>: A character....

i. Page 13: Paragraph "SS"; replace in entirety with:
<u>SUB (Substitute)</u>: A character that may be used to replace a character which is invalid or determined to be ~~erroneous.~~ in error.

j. Page 17: Paragraph A5.2, line 2; change <u>two</u> to <u>one</u>.
change <u>marks</u> to <u>mark</u>
change <u>have</u> to <u>has</u>

line 3; change <u>four</u> to <u>five</u>

k. Page 18: Table; remove entries ~~6/0~~ 4/0 and 5/12.
Add entries as follows, in proper order:

6/0	`	Opening Single Quotation Mark	Grave Accent
7/14	‾	Overline	Tilde*

* May also be used for other accents not specifically provided.

l. Page 18: Delete present paragraph A5.3
Renumber paragraph A5.4 as A5.3
Replace its last sentence by:

The wave in its code table representation is shown to suggest a means of avoiding confusion with <u>underline</u>, and to enhance its use as <u>tilde</u>.

6. Page 18: Section A6.1, line 2; change <u>simple</u> to <u>simply</u>.

7. Page 18: Section A6.3, line 2; change <u>thereby</u> to <u>there be</u>.

m. Page 19: Paragraph A6.6; replace in entirety by:

A6.6 The assignment of reverse slant and vertical line, of the brackets and the braces, and of circumflex and overline were made to minimize difficulties when using a 64-graphic device as described above.

8. Page 19: Section A6.10, line 3; add a comma after ("Fieldata" - 1961)

9. Page 20: Line 2, add commas after (these) symbols and slant.

10. Page 20: Section A7.3, line 1; last word is of.

n. (Replaces 11) Page 24: Section B4, line 2; ~~transpose~~ change Telephone and Telegraph to Telegraph and Telephone. *

First sentence; after (CCITT) add

Second sentence; replace by:

It includes all the character assignments specified for international standardization by those bodies.

Last sentence; replace by:

Their recommendations, however, are expected to permit national standardization by the various countries in seven code table positions, with three "supplementary" positions available for national standardization by those countries having an extraordinary requirement for national characters. These "national usage" positions and their assignments in this standard are shown below, with the "supplementary" positions indicated by an asterisk:

Table; delete entry 2/4; change entries as follows:

4/0	@
5/12	\
5/14 *	^
6/0 *	`
7/12	|
7/14 *	‾

Footnote * (see next page)

m! Page 20: ~~Paragraph~~ Section A7.2; after ... category were grouped add in the code table. section

X3.2.4/16
MAY 18, 1966

~~n~~ (cont'd)
m'

(Editor's note: A relocation of this sentence was missed on the galleys of X3.4-1965. It should be restored.

o. (Replaces 12)
Page 25: first line; change 11 to 10.

Second paragraph; replace by:

> In addition, in many countries number sign ("#", position 2/3) may be replaced by "£".

~~p. Page 26: Appendix B4~~

(Item n cont'd)

* An international body which establishes standards and conventions for international telecommunications, especially where the public telegraph and telephone services are governmentally owned and operated. Their recomendations are often embodied in the regulations applying to such services.

p. Page 23: Section B1.2; replace by:

B1.2 Within any particular equipment, system, or community of activity it may be necessary to substitute characters. For example, some systems may require special graphic symbols and some devices may require special control codes. (Design efforts on the standard code included consideration of these types of adaptations. So-called "secular sets" produced by such substitutions, although not conforming to this standard, may none the less be consonant with it if the substitutions are made in accordance with the guidelines of section B2.

D R A F T

2. STANDARD CODE

b7 b6 b5 → Bits					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	Column → Row ↓	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	–	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	‾
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

X3.24/163

(ADVANCE MANUSCRIPT.

X3.2/376

X3.2.4/164
~~X3.2/206~~
~~1965 January 21~~
May 18 1966

~~per X3.2/263~~

~~(9/2/65)~~

Marginal notes: Refer to X3.2.4/163
Numbered – per X3.2/263*(9/2/65)
Lettered – new ~~to~~ in X3.2.4/163

PROPOSED REVISED

AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE

* Original editorial-corrections to X3.2/206, upon which this document is based.

CBI 64/2/12

X3.2/206
1965 January 21

FOREWORD

(This foreword is not a part of the American Standard Code for Information Interchange,

This American Standard presents the standard coded character set to be used for information interchange among information processing systems, communication systems, and associated equipment.

Other standards will prescribe the means of implementing this standard in media, such as perforated tape, magnetic tape and punched cards. Further standards will deal with error control, data communication formats, keyboards, graphic representation of control characters, and code extension considerations.

x 1

The 7-bit coded character set was developed from a careful review of past work in the field, and after a comprehensive program of original research and code design was completed. Careful consideration has been given to the several conflicting code set requirements, and their resolution is reflected in the standard code.

This standard was approved as an American Standard by the American Standards Association on

Suggestions for improvement gained in the use of this standard will be welcome. They should be sent to the American Standards Association Incorporated, 10 East 40th Street, New York, New York 10016.

The ASA Subcommittee X3.2, Codes and Input-Output, through which the proposal was developed and processed, had the following personnel:

(List of X3.2 member names) 2

#

3 Replaced

The ASA Task Group X3.2.4, Code Development, which developed the proposal, had the following personnel:

J. L. Little, Chairman
National Bureau of Standards

H. Spielman, Former Chairman
Radio Corporation of America

E. F. Vidro, Jr., Secretary
Xerox Corporation

O. R. Arne
Formerly with Mergenthaler Linotype Co.

E. A. Avakian
Bunker-Ramo Corporation

J. B. Booth
Teletype Corporation

E. H. Clamons
UNIVAC Division, Sperry Rand Corp.

C. J. Davis
IBM Corporation

W. F. Emmons
IBM Corporation

R. F. Ewald
Bell Telephone Laboratories

E. S. Fergusson
Rockford Research Institute, Inc.

J. G. Griffis
Defense Communications Agency

W. F. Huf
Navy Department

D. A. Kerr
Bell Telephone Laboratories

W. Y. Lang
Bell Telephone Laboratories

E. J. Lewis
ITT Data & Information Systems Div.

E. F. Manning
Formerly with U. S. Army
Electronic Laboratories

J. K. Nelson
Western Union Telegraph Co.

L. R. Turner
National Aeronautics & Space Admin.

A. L. Whitman
Formerly with ITT Communication
Systems

It should be recognized that although X3.2 and X3.2.4 members are variously affiliated, work on an ASA subcommittee or task group is achieved primarily on an individual competence and experience basis.

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American Standard Code
for
Information Interchange

1. Scope

This coded character set is to be used for the general interchange of information among information processing systems, communication systems and associated equipment.

2. STANDARD CODE

b7 b6 b5 →					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
Bits b4 ↓	b3 ↓	b2 ↓	b1 ↓	Column → Row ↓	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB ~~SS~~	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	—	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~~¢~~ ~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

②

3. Character Representation

The standard 7-bit character representation, with b_7 the high-order bit and b_1 the low-order bit, is shown below:

EXAMPLE: The bit representation for the character "K", positioned in column 4, row 11, is:

b_7	b_6	b_5	b_4	b_3	b_2	b_1
1	0	0	1	0	1	1

The code table position for the character "K" may also be represented by the notation "column 4, row 11" or alternatively ~~alternately~~ as "4/11." The decimal equivalent of the binary number formed by bits b_7, b_6, and b_5, collectively, forms the column number, and the decimal equivalent of the binary number formed by bits b_4, b_3, b_2, and b_1, collectively, forms the row number.

b x

x
4

(COMPOSITOR'S NOTE, TO BE DELETED UPON PUBLICATION: PRINT CODE TABLE AND CHARACTER REPRESENTATION ON LEFT PAGE AND LEGEND ON ADJACENT RIGHT PAGE)

4. Legend

4.1 Control Characters

NUL	Null
SOH	Start of Heading (CC)
STX	Start of Text (CC)
ETX	End of Text (CC)
EOT	End of Transmission (CC)
ENQ	Enquiry (CC)
ACK	Acknowledge (CC)
BEL	Bell (audible or attention signal)
BS	Backspace (FE)
HT	Horizontal Tabulation (punched card skip) (FE)
LF	Line Feed (FE)
VT	Vertical Tabulation (FE)
FF	Form Feed (FE)
CR	Carriage Return (FE)
SO	Shift Out
SI	Shift In
DLE	Data Link Escape (CC)
DC1	Device Control 1
DC2	Device Control 2
DC3	Device Control 3
DC4	Device Control 4 (stop)
NAK	Negative Acknowledge (CC)
SYN	Synchronous Idle (CC)
ETB	End of Transmission Block (CC)
CAN	Cancel
EM	End of Medium
SUB ~~SS~~	Substitute ~~Start of Special Sequence~~
ESC	Escape
FS	File Separator (IS)
GS	Group Separator (IS)
RS	Record Separator (IS)
US	Unit Separator (IS)
DEL	Delete (1)

C

D

Note:
(CC) Communication Control
(FE) Format Effector
(IS) Information Separator
(1) In the strict sense, DEL is not a control character. See 5.2

n

(e)

4.2 Graphic Characters

COLUMN/ROW	SYMBOL	NAME
2/0	SP	Space (normally non-printing)
2/1	!	Exclamation Point
2/2	"	Quotation Marks (Diaeresis[2])
2/3	#	[3] Number Sign
2/4	$	Dollar Sign
2/5	%	Percent
2/6	&	Ampersand
2/7	'	Apostrophe (Closing Single Quotation Mark; Acute Accent[2])
2/8	(	Opening Parenthesis
2/9	)	Closing Parenthesis
2/10	*	Asterisk
2/11	+	Plus
2/12	,	Comma (Cedilla[2])
2/13	-	Hyphen (Minus)
2/14	.	Period (Decimal Point)
2/15	/	Slant
3/10	:	Colon
3/11	;	Semicolon
3/12	<	Less Than
3/13	=	Equals
3/14	>	Greater Than
3/15	?	Question Mark
4/0	@ ~~`~~	~~**Grave Accent* (Opening Single Quotation Mark)~~ [3] Commercial At

COLUMN/ROW	SYMBOL	NAME
5/11	[	[3] ~~**~~Opening Bracket
5/12	\	~~*Tilde*~~ [3] Reverse Slant
5/13	]	[3] ~~**~~Closing Bracket
5/14	^	[3] **Circumflex [2]
5/15	_	Underline
6/0	\`	~~**Commercial At~~ [3] Grave Accent (Opening Single Quotation Mark [2]
7/11	{	[3] ~~**~~Opening Brace
7/12	|	~~**Overline~~ [3] Vertical Line
7/13	}	[3] ~~**~~Closing Brace
7/14	~	~~**Vertical Line~~ [3] Overline (Tilde[2]; General Accent[2])

[2] The use of the symbols in 2/2, 2/7, 2/12, ~~4/0~~, ~~5/12,~~ and ~~5/14~~ 5/14, 6/0, 7/14 as diacritical marks is described in Appendix A, paragraphs A5.2 and A5.3. ~~When so used they should be preceded by~~ used with an alphabetic character ~~and a BS (Backspace) in that sequence~~.

[3] These characters should not be used in international interchange without determining that there is agreement between sender and recipient. (See Appendix B4).

5. Definitions

5.1 General

(CC) Communication Control: A functional character intended to control or facilitate transmission of information over communication networks.

(FE) Format Effector: A functional character which controls the la[illegible] or positioning of information in printing or display devices.

(IS) Information Separator: A character which is used to separate and qualify information in a logical sense. There is a group of four such characters, which are to be used in a hierarchical order.

5.2 Control Characters

NUL (Null): The all zeros character which may serve to accomplish time fill and media fill.

X
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SOH (Start of Heading): A communication control character used at the beginning of a sequence of characters which constitute a machine-sensible address or routing information. Such a sequence is referred to as the "heading". An STX character has the effect of terminating a heading.

STX (Start of Text): A communication control character which precedes a sequence of characters that is to be treated as an entity and entirely transmitted through to the ultimate destination. Such a sequence is referred to as "text". STX may be used to terminate a sequence of characters started by SOH.

ETX (End of Text): A communication control character used to terminate a sequence of characters started with STX and transmitted as an entity.

EOT (End of Transmission): A communication control character used to indicate the conclusion of a transmission, which may have contained one or more texts and any associated headings.

ENQ (Enquiry): A communication control character used in data communication systems as a request for a response from a remote station. It may be used as a "Who Are You" (WRU) to obtain identification, or may be used to obtain station status, or both.

ACK (Acknowledge): A communication control character transmitted by a receiver as an affirmative response to a sender.

BEL (Bell): A character for use when there is a need to call for human attention. It may control alarm or attention devices.

X
5

BS (Backspace): A format effector which controls the movement of the printing position one printing space backward on the same printing line. (Applicable also to display devices).

HT (Horizontal Tabulation): A format effector which controls the movement of the printing position to the next in a series of predetermined positions along the printing line. (Applicable also to display devices and the skip function on punched cards).

LF (Line Feed): A format effector which controls the movement of the printing position to the next printing line. (Applicable also to display devices).

VT (Vertical Tabulation): A format effector which controls the movement of the printing position to the next in a series of predetermined printing lines. (Applicable also to display devices).

FF (Form Feed): A format effector which controls the movement of the printing position to the first predetermined printing line on the next form or page. (Applicable also to display devices).

CR (Carriage Return): A format effector which controls the movement of the printing position to the first printing position on the same printing line. (Applicable also to display devices).

SO (Shift Out): A control character indicating that the code combinations which follow shall be interpreted as outside of the character set of the standard code table until a Shift In character is reached.

SI (Shift In): A control character indicating that the code combinations which follow shall be interpreted according to the standard code table.

DLE (Data Link Escape): A communication control character which will change the meaning of a limited number of contiguously following characters. It is used exclusively to provide supplementary controls in data communication networks.

DC1, DC2, DC3, DC4 (Device Controls): Characters for the control of ancillary devices associated with data processing or telecommunication systems, more especially switching devices "on" or "off". (If a single "stop" control is required to interrupt or turn off ancillary devices, DC4 is the preferred assignment).

NAK (Negative Acknowledge): A communication control character transmitted by a receiver as a negative response to the sender.

SYN (Synchronous Idle): A communication control character used by a sychronous transmission system in the absence of any other character to provide a signal from which synchronism may be achieved or retained.

ETB (End of Transmission Block): A communication control character used to indicate the end of a block of data for communication purposes. ETB is used for blocking data where the block structure is not necessarily related to the processing format.

CAN (Cancel): A control character used to indicate that the data with which it is sent is in error or is to be disregarded.

EM (End of Medium): A control character associated with the sent data which may be used to identify the physical end of the medium, or the end of the used, or wanted, portion of information recorded on a medium. (The position of this character does not necessarily correspond to the physical end of the medium).

~~SS (Start of Special Sequence): A control character used to indicate the start of a variable length sequence of characters which have special significance or which are to receive special handling.~~

ESC (Escape): A control character intended to provide code extension (supplementary characters) in general information interchange. The Escape character itself is a prefix affecting the interpretation of a limited number of contiguously following characters.

FS (File Separator), GS (Group Separator), RS (Record Separator) and US (Unit Separator): These information separators may be used within data in optional fashion, except that their hierarchical relationship shall be: FS is the most inclusive, then GS, then RS, and US is least inclusive. (The content and length of a File, Group, Record, or Unit are not specified).

DEL (Delete): This character is used primarily to "erase" or "obliterate" erroneous or unwanted characters in perforated tape. (In the strict sense, DEL is not a control character).

5.3 Graphic Characters

SP (Space): A normally non-printing graphic character used to separate words. It is also a format effector which controls the movement of the printing position, one printing position forward. (Applicable also to display devices).

6. General Considerations

6.1 This standard does not define the means by which the coded set is to be recorded in any physical medium, nor does it include any redundancy or define techniques for error control. Further, this standard does not define data communication character structure, data communication formats, code extension techniques, or graphic representation of control characters.

SUB (substitute) A character ~~which~~ that may be substituted for a character ~~found~~ determined to be invalid or ~~erroneous~~ in error.

ⓘ

6.2 Deviations from the standard may create serious difficulties in information interchange and should be used only with full cognizance of the parties involved.

6.3 The relative sequence of any two characters, when used as a basis for collation, is defined by their binary values.

6.4 No specific meaning is prescribed for any of the graphics in the code table except that which is understood by the users. Furthermore, this standard does not specify a type style for the printing or display of the various graphic characters.

6.5 The appendices to this standard contain additional information on the design and use of this code.

APPENDICES

(These Appendices are not a part of American Standard Code for Information Interchange, , but are included to facilitate its use.)

Appendix A

Design Considerations for the Coded Character Set

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Appendix A

Design Considerations for the Coded Character Set

A1. Introduction

The standard coded character set is intended for the interchange of information among information processing systems, communication systems, and associated equipment.

A2. Considerations Affecting the Code

There were many considerations that determined the set size, set structure, character selection, and character placement of the code. Among these were (not listed in order of priority):

(1) Need for adequate number of graphic symbols
(2) Need for adequate number of device controls, format effectors, communication controls, and information separators
(3) Desire for a nonambiguous code, i.e., one in which every code combination has a unique interpretation
(4) Physical requirements of media and facilities
(5) Error control considerations
(6) Special interpretation of the all-zeros and all-ones characters
(7) Ease in the identification of classes of characters
(8) Data manipulation requirements
(9) Collating conventions
    (a) Logical
    (b) Historical
(10) Keyboard conventions
    (a) Logical
    (b) Historical
(11) Other set sizes
(12) International considerations
(13) Programming languages
(14) Existing coded character sets

A3. Set Size

A 7-bit set is the minimum size that will meet the requirements for graphics and controls in applications involving general information interchange.

A4. Set Structure

A4.1 In discussing the set structure it is convenient to divide the set into 8 columns and 16 rows as indicated in the standard.

A4.2 It was considered essential to have a dense subset which contained only graphics. For ease of identification this graphic subset was placed in six contiguous columns.

A4.3 The first two columns were chosen for the controls for three reasons:

(1) The character NUL by its definition has the location 0/0 in the code table. NUL is broadly considered a control character.
(2) The representations in column 7 were felt to be most susceptible to simulation by a particular class of transmission error - one which occurs during an idle condition on asynchronous systems.
(3) To permit the considerations of graphic subset structure described in A6 to be satisfied, the two columns of controls had to be adjacent.

A4.4 The character set was structured to enable the easy identification of classes of graphics and controls.

A5. Choice of Graphics

A5.1 Included in the set are the numerals 0 through 9, upper and lower cases of the alphabetic letters A through Z, and those punctuation, mathematical, and business symbols considered most useful. The set includes a number of characters commonly encountered in programming languages. In particular, all the COBOL and FORTRAN graphics are included.

A5.2 In order to permit the representation of languages other than English, one ~~two~~ diacritical (or accent) mark~~s~~ ~~have~~ has been included, and provision has been made for the use of ~~four~~ five punctuation symbols alternately as diacritical marks. The pairing of these punctuation symbols with their corresponding diacritical marks was done so as to facilitate the design of a typeface which would be acceptable for both uses.

j

These arrangements are:

Col/Row	Code Table Symbol	Use Punctuation	 Diacritical
2/2	"	Quotation Marks	Diaeresis
2/7	'	Apostrophe	Acute Accent
2/12	,	Comma	Cedilla
6/0	`	Opening Single Quotation Mark	Grave Accent
~~5/12~~ 7/14	~	~~(none)~~ Overline	Tilde*
5/14	^	(none)	Circumflex

*May also be used for other accents not specifically provided.

~~A5.3 Diacritical marks should be applied in this sequence: alphabetic character, BS (Backspace), diacritical mark.~~

A5.3 The character overline is included because of its usefulness for such purposes as indicating negation or complementation. The ~~"hook"~~ ~~on~~ in its code table representation is shown to suggest a means of avoiding confusion with underline., and ~~to facilitate its use as tilde.~~ enhance

and be used as Tilde ~~wave~~ hook

A6. Graphic Subset Structure

A6.1 The basic structure of the dense graphic subset was influenced by logical collating considerations, the requirements of ~~simple~~ simply related 6-bit sets, and the needs of typewriter-like devices. For information processing, it is desirable that the characters be arranged in such a way as to minimize both the operating time and the hardware components required for ordering and sequencing operations. This requires that the relative order of characters, within classes, be such that a simple comparison of the binary codes will result in information being ordered in a desired sequence. (6

A6.2 Conventional usage requires that SP (space) be ahead of any other symbol in a collatable set. This permits a name such as "JOHNS" to collate ahead of a name such as "JOHNSON." The requirement that punctuation symbols such as comma also collate ahead of the alphabet ("JOHNS, A" should also collate before "JOHNSON") establish the special symbol locations, including SP, in the first column of the graphic subset.

A6.3 To simplify the design of typewriter-like devices, it is desirable that there ~~by~~ be only a common 1-bit difference between characters to be paired on keytops. This, together with the requirements for a contiguous alphabet, and the collating requirements outlined above, resulted in the placement of the alphabet in the last four columns of the graphic subset and the placement of the numerals in the second column of the graphic subset. (7)

A6.4 It is expected that devices having the capability of printing only 64 graphic symbols will continue to be important. It may be desirable to arrange these devices to print one symbol for the bit pattern of both upper and lower case of a given alphabetic letter. To facilitate this, there should be a single bit difference between the upper and lower case representations of any given letter. Combined with the requirement that a given case of the alphabet be contiguous, this dictated the assignment of the alphabet, as shown, in columns 4 through 7.

A6.5 To minimize ambiguity caused by the use of a 64-graphic device as described above, it is desirable, to the degree possible, that each character in column 6 or 7 differ little in significance from the corresponding character in column 4 or 5. In certain cases, this was not possible.

~~A6.6 The assignment of commercial at (@) was dictated by the fact that, in certain countries, it will be replaced by a national symbol, most typically an accented lower case letter; therefore, it was located in column 6.~~

A6.7 The resultant structure of "specials" (S), "digits" (D), and "alphabetics" (A) does not conform to the most prevalent collating convention (S-A-D) because of other more demanding code requirements.

A6.8 The need for a simple transformation from the set sequence to the prevalent collating convention was recognized, and dictated the placement of some of the "specials" within the set. Specifically, those special symbols, viz., ampersand (&), asterisk (*), comma (,), hyphen (-), period (.), and slant (/), which are most often used as identifiers for ordering information and which normally collate ahead of both the alphabet and the numerals, were not placed in the column containing the numbers, so that the entire numeric column could be rotated via a relatively simple transformation to a position higher than the alphabet. The sequence of the aforementioned "specials" was also established to the extent practical to conform to the prevalent collating convention.

A6.9 The need for a useful 4-bit numeric subset also played a role in the placement of characters. Such a 4-bit subset, including the digits and the symbols asterisk, plus (+), comma, hyphen, period, and slant, can easily be derived from the code.

A6.10 Considerations of other domestic code sets, including the Department of Defense former standard 8-bit data transmission code ("Fieldata" - 1961), as well as international requirements, played an important role in deliberations that resulted in the code. The selection and grouping of the symbols dollar sign ($), per cent (%), ampersand (&), apostrophe ('), less than (<), equals (=), and greater than (>) facilitate

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The assignment of reverse slant and vertical line the brackets and braces, and circumflex and overline were made with a view to the considerations ~~[illegible]~~ of A6.5.

contraction to either a business or scientific 6-bit subset. The position of these symbols, and of the symbols comma, hyphen, period, and slant, facilitates 9 achievement of commonly accepted pairing on a keyboard. The historic pairing of question mark and slant is preserved and the less than and greater than symbols, which have comparatively low usage, are paired with period and comma so that in dual-case keyboard devices where it is desired to have period and comma in both cases, the less than and greater than symbols are the ones displaced. Provision was made for the accommodation of alphabets containing more than 26 letters and for 6-bit contraction by the location of low-usage characters in the area following the alphabet. In addition, the requirement for the digits 10 and 11 used in Sterling monetary areas was considered in the placement of the asterisk, plus, semicolon, and colon, so that the 10 and 11 could be substituted for the semicolon and colon.

A7. Control Subset Content and Structure

A7.1 The control characters included in the set are those required for the control of terminal devices, input and output devices, format, or communication transmission and switching on a general enough basis to justify inclusion in a standard set.

A7.2 Many control characters may be considered to fall into the following categories:

(1) Communication Controls (m')
(2) Format Effectors
(3) Device Controls
(4) Information Separators

To the extent practical controls of each category were grouped in the code table. The structure chosen also facilitates the contraction of the set to a logically related 6-bit set.

A7.3 The information separators (FS, GS, RS, US) identify boundaries of various elements of information, but differ from punctuation in that they are primarily intended to be machine sensible. They were arranged in accordance with an expected hierarchical use, and the lower end of the hierarchy is contiguous in binary order with SP (space) which is sometimes used as a machine-sensible separator. Subject to this hierarchy the exact nature of their use within data is not specified. (10)

A7.4 The character SYN (Synchronous Idle) was located so that its binary pattern in serial transmission was unambiguous as to character framing, and also to optimize certain other aspects of its communication usage.

A7.5 ACK (Acknowledge) and NAK (Negative Acknowledge) were located so as to gain the maximum practical protection against mutation of one into the other by transmission errors.

Appendix B

Notes on Application

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Appendix B

Notes on Application

B1. Introduction

B1.1 The standard code was developed to provide for information interchange among information processing systems, communications systems, and associated equipment. In a system consisting of equipment with several local or native codes, maximum flexibility will be achieved if each of the native codes is translated to the standard whenever information interchange is desired.

B1.2 Within any particular equipment or closed system it may be necessary to substitute characters. For example, some systems may require special graphic symbols and some devices may require special control codes. Design efforts on the standard code included consideration of these types of adaptations.

B2. Character Substitutions

B2.1 Any character substitution will result in a coded character set which does not conform to this standard.

B2.2 It is recommended that when a character is substituted in the code table for a standard character, the standard character should not be reassigned elsewhere in the table. Such a substitute character, once assigned, should not be subsequently reassigned elsewhere.

B2.3 It is recommended that graphic substitutions be made only in the graphic area and control substitutions only in the control area. Any substitution involving a control should be made only with full cognizance of all possible operational effects.

B2.4 It should be noted that this standard specifies, for each position of the code table, the information represented by the character and not necessarily the precise action taken by the recipient when the character is received. In the case of graphics, considerable variation in the actual shape printed or displayed may be appropriate to different units, systems, or fields of application. In the case of controls, the action performed is dependent upon the use for which the particular system is intended, the application to which it is being put, and a number of conventions established by the user or designer - some system-wide and some unique to a particular unit.

B2.5 Typical examples of diversity in execution not necessarily contrary to this standard are:

1) A number of graphic symbols, other than that used in the code table, are used for ampersand in various type styles; still other symbols may be more appropriate to electronic display devices. The use of such alternate symbols does not in itself constitute deviation from the standard as long as ampersand is the concept associated with the character. Note that this does not necessarily restrict the use of such an alternate symbol design to mean "and"; in any type style ampersand may, of course, be used with arbitrary meaning.

2) A card punch in one application may "skip" when the character HT (Horizontal Tabulation: used as skip) is presented to it; in another application the character HT may be recorded in the card without further action.

B3. Related Larger and Smaller Sets

Consideration has been given to the relationship between the standard set and sets of other sizes. A number of straightforward logical transformations are possible which result in a variety of sets related to the standard. None of the transformed sets are recognized by this standard.

B4. International Considerations

This standard conforms to the anticipated recommendations of the International Organization for Standardization (ISO) and the International Telephone and Telegraph Consultative Committee (CCITT)* for a 7-bit code. ~~The characters of this code are identical to those specified for international standardization by these bodies.~~ Their recommendations, however, are expected to permit national standardization by the various countries in seven ~~eleven~~ code table positions, These "national usage" positions and their assignments in this standard are as follows, with the supplementary positions indicated by an asterisk.

See item n

with 3 supplementary positions available to those countries having an extraordinary requirement for national characters

Col/Row	Character (U.S.)
~~2/4~~	~~$~~
4/0	@
5/11	[
5/12	\
5/13	]
5/14 *	^
6/0 *	~~@~~ `
7/11	{
7/12	|
7/13	}
7/14 *	~

*See item (n)

In international interchange of information these ~~11~~ 10 characters should not be used except where it is determined that there is agreement between sender and recipient.

In addition, in ~~other~~ many countries, the Number Sign "#" (in position 2/3) may be represented as "~~No~~" "£"

B5. Communications Considerations

Certain control characters are designated as "communication controls." They are:

SOH	(Start of Heading)
STX	(Start of Text)
ETX	(End of Text)
EOT	(End of Transmission)
ENQ	(Enquiry)
ACK	(Acknowledge)
DLE	(Data Link Escape)
NAK	(Negative Acknowledge)
SYN	(Synchronous Idle)
ETB	(End of Transmission Block)

These may be used by communication systems for their internal signaling, or for the exchange of information relating to the control of the communication system between that system and its end terminals. Some such systems may impose restrictions on the use of these communication control characters by the end terminals. For example, the use of some of them may be completely prohibited while others may be restricted to use in conformity with the formats and procedures required by the communication system for its operation.

Appendix C

Original Criteria

C1. Introduction

C1.1 This Appendix contains the original criteria upon which the design of the code was based. Not all criteria have been entirely satisfied. Some are conflicting, and the characteristics of the set represent accepted compromises of these divergent criteria.

C1.2 The criteria were drawn from communication, processing, and media recording aspects of information interchange.

C2. Criteria

C2.1 Every character of the code set shall be represented by the same number of bits (i.e., binary digits).

C2.2 The standard set shall be so structured as to facilitate derivation of logically related larger or smaller sets.

C2.3 In a code of $\underline{n}$ bits, all possible 2^n patterns of ones and zeros will be permitted and considered valid.

C2.4 The number of bits, $\underline{n}$, shall be sufficient to provide for the alphabetic and numeric characters, commonly used punctuation marks, and other special symbols, along with those control characters required for interchange of information.

C2.5 The numerals 0 through 9 shall be included within a 4-bit subset.

C2.6 The numerals 0 through 9 shall be so represented that the four low-order bits shall be the binary-coded-decimal form of the particular numeral that the code represents. In the selection of the two characters immediately succeeding the numeral 9, consideration shall be given to their replacement by the graphics 10 and 11 to facilitate the adoption of the code in the Sterling monetary area.

C2.7 The interspersion of control characters among the graphic characters shall be avoided. The characters devoted to controls shall be easily separable from those devoted to graphics.

C2.8 Within the standard set, each character shall stand by itself and not depend on surrounding characters for interpretation.

C2.9 An entire case of the alphabet (A through Z) shall be included within a 5-bit subset. Consideration shall be given to the need for more than 26 characters in some alphabets.

C2.10 The letters of each case of the alphabet shall be assigned, in conventional order (A through Z), to successive, increasing binary representations.

C2.11 Suitable control characters required for communication and information processing shall be included.

C2.12 Escape functions that provide for departures from the standard set shall be incorporated.

C2.13 A simple binary comparison shall be sufficient to determine the order within each class of characters. (In this regard, the special graphics, the numerals, and the alphabet are each defined as distinct classes.) Simple binary rules do not necessarily apply between classes when ordering information.

C2.14 Space (i.e., the space between words) must collate ahead of all other graphics.

C2.15 Special symbols used in the ordering of information must collate ahead of both the alphabet and the numerals.

C2.16 Insofar as possible, the special symbols shall be grouped according to their functions; for example, punctuation and mathematical symbols. Further, the set shall be so organized that the simplest possible test shall be adequate to distinguish and identify the basic alphabetic, numeric, and special symbol subsets.

C2.17 Special symbols shall be placed in the set so as to simplify their generation by typewriters and similar keyboard devices. This criterion means, in effect, that the codes for pairs of characters that normally appear on the same keytops on a typewriter shall differ only in a common single-bit position.

C2.18 The set shall contain the graphic characters of the principal programming languages.

C2.19 The codes for all control characters shall contain a common, easily recognizable, bit pattern.

C2.20 The Null (000...) and Delete (111 . . .) characters shall be provided.

Appendix D

Terminology

This appendix is intended to clarify the sense in which certain terms are used.

Bit - Contraction of "binary digit"

Bit pattern - The binary representation of a character.

Character - A member of a coded character set; the binary representation of such a member and its graphic symbol or control function.

Code - A system of discrete representation of a set of symbols and functions.

O. C. Miles

X3.2/385
May 20, 1966

SUMMARY OF PROPOSED CHANGES

TO THE AMERICAN STANDARD CODE FOR

INFORMATION INTERCHANGE

(X3.4-1965)

As embodied in X3.2/384, Proposed Revised (1966) American Standard Code for Information Interchange --

I. Fundamental Changes

1. Move @ from 6/0 to 4/0
   move ` from 4/0 to 6/0

2. Move | from 7/12 to 7/14
   move ¬ from 7/14 to 7/12

3. In position 5/12, replace ~ by \

4. In position 2/10, replace
   SS (start of Special Sequence) by
   SUB (Substitute)

These changes produce a code table which is in complete conformity with the final ISO and CCITT agreements reached in Paris in April, 1966

TO: Recipients of This Document

FROM: T. R. Bousquet, Member X3.2

This proposed ASCII revision is being handled on an expedited basis. I am requested to return my ballot by June 2, 1966.

I plan to vote yes. If you disagree, please notify me. I may be reached at X373, Waltham.

Copies of X3.2/384 will be distributed upon request.

CBI 67/1/23

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1916 1966
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Data Processing Group

Business Equipment Manufacturers Association

235 East 42nd Street, New York, N.Y. 10017 – MUrray Hill 7-5969

Copies sent to R.P.
Mgrs. 6-13. G

1966 May 24

RECEIVED
JUN 6 1966
GILBERT PUENTE

TO: Members of Sectional Committee X3 and
DPG Standards Committee

You will recall that at its March meeting in Phoenix, Sectional Committee X3 authorized a letter ballot to approve a change in the Revised ASCII (X3.4/1965), i.e., interchanging the graphics "grave accent" and "commercial at" in the code table, in anticipation of such a change being made in the ISO 7-bit code by TC97/SC2 in Paris. At the same time, ASA delayed the printing and distribution of X3.4/1965, expecting this change to be reflected in a final version of the Revised ASCII. To-date, ASA has not printed or distributed X3.4/1965.

SC2 did approve the above change, but also approved several others beyond the scope of the present X3 letter ballot authorization. All of these changes were approved unanimously by SC2 and the CCITT, which met jointly with SC2, and are intended as the final changes in the current CCITT Alphabet and draft ISO 7-bit Code Recommendation.

At its May 19 meeting, subcommittee X3.2 considered these actions and proposed similar changes in the Revised ASCII (X3.4/1965) to bring it into conformity with the new ISO 7-bit Code. The changes proposed in X3.4/1965 are embodied in the two attached documents, X3.2/384 and X3.2/385 (Proposed Revised (1966) ASCII and Summary of Changes, respectively).

X3.2 passed the following resolution concerning these documents:

Resolved that:

> An X3.2 letter ballot be taken on documents X3.2/384 and X3.2/385, (Proposed Revised (1966) ASCII and Summary of Changes, respectively), to be returned on or before June 2, 1966.
>
> Further, X3.2 requests the Secretary of X3 to distribute the results of the X3.2 letter ballot and copies of documents 384 and 385 to X3 in advance of the June 30 X3 meeting, and

NMAH 310/5

recommends that X3 "expedite the approval of document 384 as a revision of the Revised ASCII (X3. 4/1965), waving the publication period."

Pursuant to the above resolution, we are enclosing documents 384 and 385 for your review. Please review them in detail, since at the June 30 meeting, X3 will be asked to authorize a 30-day letter ballot to approve Document X3. 2/384 as a revision to the Revised ASCII (X3. 4/1965).

Paul B. Goodstat

Paul B. Goodstat
Secretary, X3

PBG:ch
Enc.

GRIFFIN

ISO General Secretariat
1, rue de Varembé
Geneva

ISO/TC 97 (Secretariat - 90) 141 E
June 1966

ISO
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

DRAFT ISO RECOMMENDATION
No. 1052

6 AND 7 BIT CODED CHARACTER SETS FOR INFORMATION PROCESSING INTERCHANGE

proposed by Technical Committee

ISO/TC 97 - Computers and information processing

(Secretariat : U.S.A.)

This Draft ISO Recommendation is submitted to all the ISO Member Bodies

(See "Questionnaire", document ISO/TC 97 (GS - 4) 143 E)

NMAH 310/5

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2.1 6-Bit set table

								0	0	1	1
								0	1	0	1
Bits	b_6	b_5	b_4	b_3	b_2	b_1	Column / Row	0	1	2	3
			0	0	0	0	0	SP	0	NUL	P
			0	0	0	1	1	F_1 (HT)	1	A	Q
			0	0	1	0	2	F_2 (LF) ①)	2	B	R
			0	0	1	1	3	F_3 (VT)	3	C	S
			0	1	0	0	4	F_4 (FF)	4	D	T
			0	1	0	1	5	F_5 (CR) ①)	5	E	U
			0	1	1	0	6	SO	6	F	V
			0	1	1	1	7	SI	7	G	W
			1	0	0	0	8	(	8	H	X
			1	0	0	1	9	)	9	I	Y
			1	0	1	0	10	*	: ⑥)	J	Z
			1	0	1	1	11	+	; ⑥)	K	([) ③)
			1	1	0	0	12	,	< ⑥) $ ②)	L	(£ ②) ③)
			1	1	0	1	13	—	= %	M	(]) ③)
			1	1	1	0	14	.	> &	N	ESC
			1	1	1	1	15	/	'	O	DEL

E

NOTES ABOUT THE 6

① The controls CR and LF are intended for printer equipment which requires separate combinations to return the carriage and to feed a line.

For equipment which uses a single control for a combined carriage return and line feed operation.

- in the 6-bit set table, the function F_2 will have the meaning of " New Line " (NL). F_5 will then have the meaning of " Backspace " (BS);
- in the 7-bit set table, the function FE_2 will have the meaning of " New Line " (NL).

These substitutions require agreement between the sender and the recipient of the data.

The use of this function " NL " is not allowed for international transmission on general telecommunication networks (Telex and Telephone networks).

② For international information interchange, $ and £ symbols do not designate the currency of a given country. The use of these symbols combined with other graphic symbols to designate national currencies may be the subject of other Recommendations.

③ " Reserved for National Use ". These positions are primarily intended for alphabetic extensions. If they are not required for that purpose, they may be used for symbols and a recommended choice is shown in parentheses in some cases.

Some restrictions are placed on the use of these characters on the general telecommunication networks for international transmission.

④ These three positions are normally provided for the diacritical signs " circumflex ", " grave accent " and " overline ". However,

OTES

2.1 7-Bit set table

								0	0	0	0	1	1	1	1
								0	0	1	1	0	0	1	1
								0	1	0	1	0	1	0	1
b_7	b_6	b_5	b_4	b_3	b_2	b_1	Column Row	0	1	2	3	4	5	6	7
			0	0	0	0	0	NUL	(TC$_7$)DLE	SP	0	@ ③)	P	④)	p
			0	0	0	1	1	(TC$_1$) SOH	DC$_1$	!	1	A	Q	a	q
			0	0	1	0	2	(TC$_2$) STX	DC$_2$	" ⑥)	2	B	R	b	r
			0	0	1	1	3	(TC$_3$) ETX	DC$_3$	£ ②) ⑦)	3	C	S	c	s
			0	1	0	0	4	(TC$_4$) EOT	DC$_4$	$ ②)	4	D	T	d	t
			0	1	0	1	5	(TC$_5$) ENQ	(TC$_8$)NAK	%	5	E	U	e	u
			0	1	1	0	6	(TC$_6$) ACK	(TC$_9$)SYN	&	6	F	V	f	v
			0	1	1	1	7	BEL	(TC$_{10}$)ETB	' ⑥	7	G	W	g	w
			1	0	0	0	8	FE$_0$ (BS)	CAN	(	8	H	X	h	x
			1	0	0	1	9	FE$_1$ (HT)	EM	)	9	I	Y	i	y
			1	0	1	0	10	FE$_2$ (LF) ①)	SUB	*	: ⑧)	J	Z	j	z
			1	0	1	1	11	FE$_3$ (VT)	ESC	+	; ⑧)	K	([) ③)	k	③)
			1	1	0	0	12	FE$_4$ (FF)	IS$_4$ (FS)	,	<	L	③)	l	③)
			1	1	0	1	13	FE$_5$ (CR) ①)	IS$_3$ (GS)	—	=	M	(]) ③)	m	③)
			1	1	1	0	14	SO	IS$_2$ (RS)	.	>	N	^ ④) ⑥)	n	‾ ④) ⑤)
			1	1	1	1	15	SI	IS$_1$ (US)	/	?	O	_	o	DEL

7 BIT SET TABLE

these positions may be used for other graphical symbols when it i ecessary to have 8, 9 or 10 positions for national use.

) For international information interchange, this position is used for the graphical symbol — (overline), the graphical representation which may vary according to national use to represent ~ (de) or another diacritical sign provided that there is no risk of confusion with another graphical symbol included in the table.

e graphics in positions 2/2, 2/7, 5/14 of the 7-bit set table have pectively the significance of " quotation mark ", " apostrophe " and " upwards arrow "; however, these characters take on the significance of " diæresis ", " acute accent " and " circumflex ent " diacritical signs when they follow the " Backspace " aracter.

⑦ In countries where there is no requirement for the symbol £ the symbol # may be used in position 2/3 of the 7-bit set table.

⑧ If 10 and 11 as single characters are needed (for example, for Sterling currency subdivision), they should take the place of " colon " (:) and " semi-colon " (;) respectively. These substitutions require agreement between the sender and the recipient of the data.

On the general telecommunication networks, the characters " colon " and " semi-colon " are the only ones authorized for international transmission.

⑨ Either of the two sets of three symbols shown in these positions in the table may be chosen; the interpretation of the corresponding combinations requires agreement between the sender and the recipient of the data.

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ISO/TC 97 (Secretariat - 90) 141 E
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ISO
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

DRAFT ISO RECOMMENDATION
No. 1052

RM AH 31/4/6

6 AND 7 BIT CODED CHARACTER SETS FOR INFORMATION PROCESSING INTERCHANGE

proposed by Technical Committee
ISO/TC 97 - Computers and information processing
(Secretariat : U.S.A.)

This Draft ISO Recommendation is submitted to all the ISO Member Bodies

(See "Questionnaire", document ISO/TC 97 (GS - 4) 143 E)

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A:12695-1/E

BRIEF HISTORY

The present Recommendation was prepared by Technical Committee ISO/TC 97, Subcommittee 2, the Secretariat of which is held by AFNOR.

The Technical Committee began its work in 1962; national contributions were submitted at the Paris May 1962 meeting by the following (P) Members of Subcommittee 2: France, Germany, Italy, United Kingdom, United States.

A synthesis of the various proposals was achieved and the resulting draft circulated for further discussions in October 1962.

After that meeting, Committee ISO/TC 97 circulated, for vote and comments, the first draft proposal [as contained in document ISO/TC 97/SC 2 (Secr. 12) 30 January 1963]. A majority (7 for, 3 against, and 2 not replying) was in favor of this draft proposal [see document ISO/TC 97/SC 2 (Secr. 14) 37].

During its October 1963 meeting, Subcommittee 2 considered the various comments received, and a second draft proposal [ISO/TC 97/SC 2 (Secr. 22) 75] embodied all the agreed amendments. Following Resolution 1 of this meeting, the second draft proposal was circulated for vote and comments among (P) and (O) Members of ISO/TC 97.

The result of this second letter ballot [as shown in document ISO/TC 97/SC 2 (Secr. 24) 77] was 11 for approval (Belgium, France, Germany, Italy, Japan, Poland, Spain, Sweden, Switzerland, United Kingdom, United States), none against. However, as most of the comments were of substance, document 75 was reconsidered at the New York meeting of ISO/TC 97/SC 2 (May, 11-15 1964).

The third draft proposal embodied all the amendments agreed upon during the May 1964 meeting.

The fourth ISO Draft proposal (as given in document ISO/TC 97/SC 2 (Secr. 37) 130, March 1965), drafted in order to incorporate some observations from the International Telegraph and Telephone Consultative Committee (CCITT), has been unanimously approved (with or without comment) by a vote within plenary Committee ISO/TC 97.

In accordance with Resolutions 6 and 7 taken by Committee ISO/TC 97 (Tokyo, October 1965) the comments received, particularly those from the CCITT, were examined at a joint ISO/CCITT meeting (Paris, April 1966). Taking action on Resolution 1 taken by Subcommittee ISO/TC 97/SC 2 (Paris, April 1966), the present Draft ISO Recommendation is submitted to the approval of every ISO Member Body.

Draft ISO Recommendation No. 1052

6 AND 7 BIT CODED CHARACTER SETS FOR INFORMATION PROCESSING INTERCHANGE

1. GENERAL

1.1 Purpose

1.1.1 This Recommendation defines two character sets for general usage, including letters, figures, punctuation marks, other symbols and controls, with their coded representation.

1.1.2 The requirements for graphics and controls in data handling and programming, in accordance with computer and ancillary equipment characteristics, have been taken into account in determining these character sets.

1.1.3 The Recommendation consists of two tables with notes, a legend, explanatory notes and the definitions of functional characteristics related to control characters.

1.2 Scope

1.2.1 These character sets are primarily intended for the interchange of information among data processing systems and associated equipment. They may be regarded as basic alphabets in the abstract sense.

1.2.2 These character sets are applicable to all so-called latin alphabets.

1.2.3 One character set contains 6-bit characters and provides 64 coded characters, the other contains 7-bit characters and provides 128 coded characters. The two sets are compatible in that they are logically related. This facilitates the conversion between the two sets.

1.3 Implementation

1.3.1 These character sets may be implemented in various media with logically related codes, as appropriate. For example, this could include punched tapes, punched cards, magnetic tapes and transmission channels, thus permitting interchange of data to take place either indirectly by means of an intermediate recording in a physical medium, or by local electrical connection of various units (such as input and output devices and computers) or by means of data transmission equipment.

1.3.2 It is the subject of other ISO Recommendations to describe the means of recording these character sets in physical media and the means of encoding them for transmission while taking into account the need for error checking *.

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* For the implementation of codes
- on punched tape, see Recommendation ISO/R... [Now, Draft proposal ISO/TC 97 (Secr. 78) 128, March 1966]
- on punched cards, see Recommendation ISO/R... [Now, Draft proposal ISO/TC 97/SC 2 (Secr. 65) 216, May 1966]
- on 7 and 9 track magnetic tapes, see Recommendations ISO/R... and ISO/R... [Now, Draft Recommendation ISO/TC 97/SC 2 (Secr. 66) 217, May 1966 and Draft proposal ISO/TC 97/SC 2 (Secr. 67) 218, May 1966.]

2. TABLES AND NOTES

2.1 6-Bit set table

Bits					b₆ →	0	0	1	1
					b₅ →	0	1	0	1
	b₄	b₃	b₂	b₁	Row \ Column	0	1	2	3
	0	0	0	0	0	SP	0	NUL	P
	0	0	0	1	1	F₁ (HT)	1	A	Q
	0	0	1	0	2	F₂ (LF) ①)	2	B	R
	0	0	1	1	3	F₃ (VT)	3	C	S
	0	1	0	0	4	F₄ (FF)	4	D	T
	0	1	0	1	5	F₅ (CR) ①)	5	E	U
	0	1	1	0	6	SO	6	F	V
	0	1	1	1	7	SI	7	G	W
	1	0	0	0	8	(	8	H	X
	1	0	0	1	9	)	9	I	Y
	1	0	1	0	10	*	: ⑧)	J	Z
	1	0	1	1	11	+	; ⑧)	K	([) ③)
	1	1	0	0	12	,	< $ ②)	L	(£ ②) ③)
	1	1	0	1	13	—	= ⑨) %	M	(]) ③)
	1	1	1	0	14	.	> &	N	ESC
	1	1	1	1	15	/	'	O	DEL

2.1 7-Bit set table

Bits							b₇ →	0	0	0	0	1	1	1	1
							b₆ →	0	0	1	1	0	0	1	1
							b₅ →	0	1	0	1	0	1	0	1
	b₇	b₆	b₅	b₄	b₃	b₂	b₁ / Row \ Column	0	1	2	3	4	5	6	7
				0	0	0	0 / 0	NUL	(TC₇)DLE	SP	0	@ ③)	P	④)	p
				0	0	0	1 / 1	(TC₁) SOH	DC₁	!	1	A	Q	a	q
				0	0	1	0 / 2	(TC₂) STX	DC₂	" ⑥)	2	B	R	b	r
				0	0	1	1 / 3	(TC₃) ETX	DC₃	£ ②) ⑦)	3	C	S	c	s
				0	1	0	0 / 4	(TC₄) EOT	DC₄	$ ②)	4	D	T	d	t
				0	1	0	1 / 5	(TC₅) ENQ	(TC₈)NAK	%	5	E	U	e	u
				0	1	1	0 / 6	(TC₆) ACK	(TC₉)SYN	&	6	F	V	f	v
				0	1	1	1 / 7	BEL	(TC₁₀)ETB	' ⑥	7	G	W	g	w
				1	0	0	0 / 8	FE₀ (BS)	CAN	(	8	H	X	h	x
				1	0	0	1 / 9	FE₁ (HT)	EM	)	9	I	Y	i	y
				1	0	1	0 / 10	FE₂ (LF) ①)	SUB	*	: ⑧)	J	Z	j	z
				1	0	1	1 / 11	FE₃ (VT)	ESC	+	; ⑧)	K	([) ③)	k	③)
				1	1	0	0 / 12	FE₄ (FF)	IS₄ (FS)	,	<	L	③)	l	③)
				1	1	0	1 / 13	FE₅ (CR) ①)	IS₃ (GS)	—	=	M	(]) ③)	m	③)
				1	1	1	0 / 14	SO	IS₂ (RS)	.	>	N	^ ④) ⑥)	n	‾ ④) ⑤)
				1	1	1	1 / 15	SI	IS₁ (US)	/	?	O	_	o	DEL

Notes about the 6 and 7 bit set table

① The controls CR and LF are intended for printer equipment which requires separate combinations to return the carriage and to feed a line.
For equipment which uses a single control for a combined carriage return and line feed operation.
- in the 6-bit set table, the function F₂ will have the meaning of "New Line" (NL). F₅ will then have the meaning of "Backspace" (BS);
- in the 7-bit set table, the function FE₂ will have the meaning of "New Line" (NL).

These substitutions require agreement between the sender and the recipient of the data.

The use of this function "NL" is not allowed for international transmission on general telecommunication networks (Telex and Telephone networks).

② For international information interchange, $ and £ symbols do not designate the currency of a given country. The use of these symbols combined with other graphic symbols to designate national currencies may be the subject of other Recommendations.

③ "Reserved for National Use". These positions are primarily intended for alphabetic extensions. If they are not required for that purpose, they may be used for symbols and a recommended choice is shown in parentheses in some cases.
Some restrictions are placed on the use of these characters on the general telecommunication networks for international transmission.

④ These three positions are normally provided for the diacritical signs "circumflex", "grave accent" and "overline". However, these positions may be used for other graphical symbols when it is necessary to have 8, 9 or 10 positions for national use.

⑤ For international information interchange, this position is used for the graphical symbol — (overline), the graphical representation of which may vary according to national use to represent ~ (tilde) or another diacritical sign provided that there is no risk of confusion with another graphical symbol included in the table.

⑥ The graphics in positions 2/2, 2/7, 5/14 of the 7-bit set table have respectively the significance of "quotation mark", "apostrophe" and "upwards arrow"; however, these characters take on the significance of "diæresis", "acute accent" and "circumflex accent" diacritical signs when they follow the "Backspace" character.

⑦ In countries where there is no requirement for the symbol £ the symbol # may be used in position 2/3 of the 7-bit set table.

⑧ If 10 and 11 as single characters are needed (for example, for Sterling currency subdivision), they should take the place of "colon" (:) and "semi-colon" (;) respectively. These substitutions require agreement between the sender and the recipient of the data.

On the general telecommunication networks, the characters "colon" and "semi-colon" are the only ones authorized for international transmission.

⑨ Either of the two sets of three symbols shown in these positions in the table may be chosen; the interpretation of the corresponding combinations requires agreement between the sender and the recipient of the data.

3. LEGEND

3.1 Controls

ACK	Acknowledge
BEL	Bell
BS	Backspace
CAN	Cancel
CR	Carriage Return
DC	Device Control
DEL	Delete
DLE	Data Link Escape
EM	End of Medium
ENQ	Enquiry
EOT	End of Transmission
ESC	Escape
ETB	End of Transmission Block
ETX	End of Text
F	Function
FE	Format Effector
FF	Form Feed
FS	File Separator
GS	Group Separator
HT	Horizontal Tabulation
IS	Information Separator
LF	Line Feed
NAK	Negative Acknowledge
NL	New Line
NUL	Null
RS	Record Separator
SI	Shift-In
SO	Shift-Out
SOH	Start of Heading
SP	Space
STX	Start of Text
SUB	Substitute
SYN	Synchronous Idle
TC	Transmission Control
US	Unit Separator
VT	Vertical Tabulation

3.2 Graphical Symbols

Graphical Representation	Name	Position in the code tables *	
		6-bit	7-bit
(Space)	A normally non-printing graphic character	0/0	2/0
!	Exclamation mark	—	2/1
"	Quotation mark, Diacresis (note (6))	—	2/2
£	Currency symbol £ (note (2))	3/12	2/3
$	Currency symbol $ (note (2))	1/12	2/4
%	Percent	1/13	2/5
&	Ampersand	1/14	2/6
'	Apostrophe, Acute accent (note (6))	1/15	2/7
(	Left parenthesis	0/8	2/8
)	Right parenthesis	0/9	2/9
*	Asterisk	0/10	2/10
+	Plus sign	0/11	2/11
,	Comma	0/12	2/12
—	Hyphen, minus sign	0/13	2/13
.	Full stop (period)	0/14	2/14
/	Solidus	0/15	2/15
:	Colon	1/10	3/10
;	Semi-colon	1/11	3/11
<	Less than	1/12	3/12
=	Equals	1/13	3/13
>	Greater than	1/14	3/14
?	Question mark	—	3/15
@	Commercial at	—	4/0
[	Left square bracket	3/11	5/11
]	Right square bracket	3/13	5/13
^	Upwards arrow, Circumflex accent (note (6))	—	5/14
—	Underline	—	5/15
	Grave accent	—	6/0
—	Overline (note (5))	—	7/14

Notes (2) (5) (6) see pages 6-7.

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* See paragraph 4.1 page 10.

4. EXPLANATORY NOTES

4.1 Numbering of the positions in the code tables

Within any one character the bits are identified by b_7, b_6... b_1, where b_7 or b_6 is the highest order, or most significant bit, and b_1 is the lowest order, or least significant bit.

If desired these may be given a numerical significance in the binary system, thus:

Bit identification:	b_7	b_6	b_5	b_4	b_3	b_2	b_1
Significance:	64	32	16	8	4	2	1

In the code tables the columns and rows are identified by numbers written in binary and decimal notations.

Any one position in a code table may be identified either by its bit pattern, or by its column and row numbers. For instance, the position containing the figure 1 in the 7-bit set table may be identified:

- by its bit-pattern, e.g. 011 0001
- by its column and row numbers, e.g. 3/1.

4.2 Diacritical signs

In the 7-bit character set, some printing symbols may be designed to permit their use for the composition of accented letters when necessary for general interchange of information. A sequence of three characters, comprising a letter, " Backspace " and one of these symbols, is needed for this composition, and the symbol is then regarded as a diacritical sign. It should be noted that these symbols take on their diacritical significance only when they are preceded or followed by the " Backspace " character; for example, the symbol corresponding to the code combination 2/7 (') normally has the significance of " apostrophe ", but becomes the diacritical sign " acute accent " when preceded by the " Backspace " character.

In order to increase efficiency, it is possible to introduce accented letters (as single characters) in the positions marked by note ③ in the code tables. According to national requirements, these positions may contain special diacritical signs.

5. FUNCTIONAL CHARACTERISTICS RELATED TO CONTROL CHARACTERS

Some definitions in this section are stated in general terms and more explicit definitions of use may be needed for specific implementation of the code tables. These more explicit definitions may become the subject of other Recommendations.

A control character may be identified by a general designation, by a specific designation or by a combination of both.

5.1 General designations of control characters

The general designations of control characters involve a specific name followed by a subscript number.

They are defined as follows:

TC TRANSMISSION CONTROL

A functional character intended to control or facilitate transmission of information over telecommunication networks.

The use of the TC characters on the general telecommunication networks may be the subject of future Recommendations.

FE FORMAT EFFECTOR

A functional character which controls the layout or positioning of information in Input/Output media.

DC DEVICE CONTROL

A functional character for the control of an ancillary device associated with a data processing or telecommunication system, more especially an " On " or " Off " switching device.

The following is an example of how device control characters could be used in a specific tape system employing two ancillary tape punches and one ancillary tape reader:

DC_1 — First Punch " On "
DC_2 — Second Punch " On "
DC_3 — Tape reader " On "

The DC_4 character has a specific function, defined in paragraph 5.2 page 12.

IS INFORMATION SEPARATOR

A functional character which is used to separate and qualify information blocks in a logical sense. There is a group of four such characters, which are intended to be used in a hierarchical order.

F FUNCTION

A functional character in the 6-bit set, which may have the combined or alternative meanings of IS or FE.

Control characters with a general designation FE, IS and F have a specific designation. These appear next to them, in parentheses, in the code tables. These specific designations, the definitions of which are given in paragraph 5.2, have been chosen from the terminology used for some types of equipment. In other types of equipment, different but related meanings may be associated with certain of these control characters, but this requires agreement between the sender and the recipient of the data.

5.2 Specific designations of control characters

These are defined as follows:

ACK ACKNOWLEDGE

A Transmission Control character transmitted by a receiver as an affirmative response to a sender.

BEL BELL

A character for use when there is a need to call for human attention; it may control alarm or attention devices.

BS BACKSPACE

A layout character which controls the movement of the printing position one printing space backward on the same printing line.

CAN CANCEL

A character used to indicate that the information it accompanies is in error.

CR CARRIAGE RETURN

A layout character which controls the movement of the printing position to the first printing position on the same printing line.

DC 4 A Device Control character used to interrupt or turn off ancillary devices (STOP).

DEL DELETE

This character is used primarily to erase or obliterate erroneous or unwanted characters in punched tape. DEL characters may be inserted into or removed from a stream of data without affecting the information content of that stream. DEL characters may serve to accomplish media-fill or time-fill but then the addition or removal of these characters may affect the information layout and/or the control of equipment.

DLE DATA LINK ESCAPE

A Transmission Control character which will change the meaning of a limited number of contiguously following characters. It is used exclusively to provide supplementary data transmission control functions. Only graphics and Transmission Control characters can be used in DLE sequences.

EM END OF MEDIUM

A control character which may be used to identify the physical end of the medium, or the end of the used, or wanted, portion of information recorded on a medium. The position of this character does not necessarily correspond to the physical end of the medium.

ENQ ENQUIRY

A Transmission Control character used as a request for a response from a remote station—the response may include station identification and/or station status. When a " Who are you " function is required on the general switched transmission network, the first use of ENQ after the connection is established shall have the meaning " Who are you " (station identification). Subsequent use of ENQ may, or may not, include the function " Who are you ", as determined by agreement.

EOT END OF TRANSMISSION

A Transmission Control character used to indicate the conclusion of the transmission of one or more texts.

ESC ESCAPE

A functional character which may be used to extend the standard character set of the code table. It is a warning or non-locking shift character which changes the meaning of the next single following code combination. The precise meaning of the character following Escape requires prior agreement between the sender and the recipient of the data. Where required the character following Escape may extend the Escape sequence.

Escape sequences are used primarily to obtain additional control functions which may provide amongst other things graphics or graphic sets outside the standard set. Such control functions must not be used as additional Transmission Controls.

Null and Delete and the ten Transmission Controls must not be used in defining Escape sequences. Where they appear in an actual Escape sequence they shall retain their standard meaning and be disregarded in the interpretation of the Escape sequence.

The use of certain Escape sequences will be the subject of further Recommendations.

ETB END OF TRANSMISSION BLOCK

A Transmission Control character used to indicate the end of a transmission block of data where data is divided into such blocks for transmission purposes.

ETX END OF TEXT

A Transmission Control character which terminates a text.

FF FORM FEED

A layout character which controls the movement of the printing position to the first predetermined printing line on the next form.

FS FILE SEPARATOR

See Unit Separator (US) for definition.

GS GROUP SEPARATOR

See Unit Separator (US) for definition.

HT Horizontal Tabulation

A layout character which controls the movement of the printing position to the next in a series of predetermined positions along the printing line.

LF Line Feed

A layout character which controls the movement of the printing position to the next printing line.

NAK Negative Acknowledge

A Transmission Control character transmitted by a receiver as a negative response to the sender.

NL New Line

A layout character which controls the movement of the printing position to the first printing position of the next printing line.

NUL Null

A character whose sole purpose is to accomplish media-fill or time-fill. NUL characters may be inserted into or removed from a stream of data without affecting the information content but then the information layout and/or the control of equipment may be affected.

RS Record Separator

See Unit Separator (US) for definition.

SI Shift-in

The shift-in character means that the code combinations which follow shall be interpreted according to the standard code table.

SO Shift-out

The shift-out character means that the code combinations which follow shall be interpreted as outside of the standard code table until a shift-in character is reached. However, all the control characters (columns 0 and 1 the 7-bit code table) and Delete will retain their standard interpretation. The shift-out character is reserved primarily for extension to the graphics.

SOH Start of Heading

A Transmission Control character used as the first character of a heading of an information message.

SP Space

A normally non-printing graphic character used to separate words. It is also a layout character which controls the movement of the printing position, one printing position forwards.

STX Start of Text

A Transmission Control character which precedes a text and which is used to terminate a heading.

SUB Substitute

A Substitute character used to replace a character which is determined to be invalid or in error.

SYN Synchronous Idle

A Transmission Control character used by a synchronous transmission system in the absence of any other character (idle condition) to provide a signal from which synchronism may be achieved or retained between data terminal equipments.

US Unit Separator

Terminates an information block called a UNIT. Similarly, RECORD SEPARATOR (RS), GROUP SEPARATOR (GS), FILE SEPARATOR (FS) terminate information blocks called RECORD, GROUP, FILE, respectively.
The four information separators are in the hierarchical ascending order US, RS, GS, FS.
An information block must not be split by high order separator; e.g. a record may contain a whole number of " units ", but may not contain a part of a " unit ".

VT Vertical Tabulation

A layout character which controls the movement of the printing position to the next in a series of predetermined printing lines.

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June 1966

ISO

INTERNATIONALE ORGANISATION FOR STANDARDIZATION

EXPLANATORY REPORT

of the ISO/TC 97 (U.S.A.) concerning

Draft ISO Recommendation No. 1052 - 6 and 7 Bit Coded Character Sets for Information Processing Interchange
(document ISO/TC 97 (Secretariat - 90) 141 E)

proposed by Technical Committee ISO/TC 97 - Computers and information processing.

The definition of 6 and 7 bit coded character sets for information processing interchange was decided in May 1962 at the first meeting of Sub-Committee ISO/TC 97/SC 2 - Character Sets and Coding. Beginning with the second meeting (October 1962), a first draft proposal was prepared and circulated to the Members of Technical Committee ISO/TC 97 for vote and comment. A rather wide majority approved the document in principle, but there were also negative votes and a great many comments.

At the third meeting (October 1963), Sub-Committee 2 drew up a second draft proposal, taking the comments received into account. This draft proposal was forwarded to Technical Committee ISO/TC 97 for vote and was approved by 11 ballots out of 11. The votes were, however, again accompanied by comments requiring consideration. Sub-Committee 2 was consequently requested to prepare a third draft proposal, which was put into shape at the fourth meeting (May 1964) of the Sub-Committee. This draft proposal attracted the attention of the International Telegraph and Telephone Consultative Committee (CCITT) which, in October 1964, held a meeting of its Working Group "New Alphabet" of special Commission A "Data Transmission" and put forward various observations. The ISO/TC 97/SC 2 Secretariat deemed it necessary to take these observations into consideration and prepared a fourth draft proposal, combining the third draft proposal with certain of the CCITT comments. This proposal was also widely approved by ISO (6 approvals without comment, 5 approvals with comment, no disapprovals) but was the subject of substantial new comments on the part of the CCITT.

At its Tokyo meeting in October 1965, Technical Committee ISO/TC 97 looked into the great advantage of having the same document include coded characters used for both data transmission and international telegraphic transmission.

It was, therefore, decided to hold up the ISO approval procedure for the time being and to call a joint meeting of ISO/TC 97/SC 2 - CCITT/GM ALP. This meeting was held in Paris in April 1966 and led to completion of a fifth draft proposal.

Sub-Committee 2 then passed the following Resolution :

"Delegations present of Subcommittee ISO/TC 97 SC/2, taking into account the unanimous vote of the joint ISO/TC 97/SC 2 - CCITT/GM ALP meeting held in Paris from 26th to 28th April 1966 unanimously approve the amendments made to draft Recommendation 97 N 78 during that joint meeting, and agreed on some minor additional amendments.

"They consider that the amendments, while they are of great importance in regard to the definitive agreement they permit between CCITT and ISO, do not alter the essential basis of the agreement previously registered within ISO/TC 97 on Draft Recommendation 97 N 78.

They unanimously request ISO/TC 97 Secretariat to utilize the accelerated procedures of ISO by introducing the above amendments into the present Draft ISO Recommendation prior to its circulation to ISO Member Bodies for final approval.

"The special attention of the General Secretariat should be called to the advisability of giving priority to a quick publication of this important and urgent Recommendation"

Implementing this Resolution, and at the request of the ISO/TC 97 Secretariat, the ISO General Secretariat hereby submits as a Draft ISO Recommendation the above-mentioned fifth draft proposal to the ISO Member Bodies for vote.

USA
STANDARDS INSTITUTE

United States of America Standards Institute

SECTIONAL COMMITTEE CORRESPONDENCE

Subcommittee X3.2, Codes and Input-Output
Minutes of meeting #55, October 20, 1966
BEMA, New York, New York

HIGHLIGHTS

It was reported that the General Purpose Paper Card Standard had issued, and that the revised ISO 6- and 7-bit code proposal was being submitted for final approval.

The perforated tape take-up reel standard was approved by the subcommittee for further processing.

Work was begun on the establishment of standards for edge-punched cards.

The various task groups generally indicated progress both on domestic and international matters, and several of the groups secured approval of their proposed programs of future work.

The next meeting will be held the week of December 12, 1966 at BEMA, New York.

NMAH
316/6

APPENDIX A

X3.2 ATTENDANCE LIST
MEETING #55 10/20/66

Name	Organization	Status
L. L. Griffin	MBS	Chairman
R. M. Brown	DOD	Vice Chairman
D. A. Kerr	BTL	M (Sec. Pro-Tem)
U. C. S. Dilks	Burroughs	O
J. S. Murphy	Burroughs	A
J. L. Little	NBS	M
C. M. Riggle	CDC	A
N. Clark	CDC	M
L. R. Turner	LeRC NASA	O
E. H. Clamons	UNIVAC	C
S. Grunkorn	N.Y. Stock Exch.	A
E. Avakian	Bunker-Ramo	M
M. R. Jepson	AT&TCo	M
Miss M. Hill	CDC - X3.6 Liaison	O
F. W. Smith	Western Union	A
J. F. Auwaerter	Teletype Corp.	M
H. Hoots	Lindsay-Schaub Newspapers	M
C. Crandall	NCR	M
F. J. Terrio	IBM	O
J. L. Smith	IBM	A
C. E. MacKenzie	IBM	M
C. F. Vidro, Jr.	Xerox Corp.	M
H. Spielman	RCA	M
R. E. Utman	JUG	M
J. Klapkiw	Honeywell	A
J. E. Heins	SCM, Kleinschmidt Div.	A
R. Kudisch	CSI	M
R. Adams	A. B. Dick Co.	M
S. Erdreich	Sperry Rand UNIVAC	M
R. J. Donahue	Mergenthaler Linotype Co.	M
P. B. Goodstat*	BEMA	O

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* Part time

ISO General Secretariat
1, rue de Varembé
Geneva

ISO/TC 97 (Secretariat - 90) 141 E
June 1966

ISO
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

DRAFT ISO RECOMMENDATION
No. 1052

6 AND 7 BIT CODED CHARACTER SETS FOR INFORMATION PROCESSING INTERCHANGE

proposed by Technical Committee

ISO/TC 97 - Computers and information processing

(Secretariat : U.S.A.)

This Draft ISO Recommendation is submitted to all the ISO Member Bodies

(See "Questionnaire", document ISO/TC 97 (GS - 4) 143 E)

BI 67/1/22

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A: 12695-1/E

BRIEF HISTORY

The present Recommendation was prepared by Technical Committee ISO/TC 97, Subcommittee 2, the Secretariat of which is held by AFNOR.

The Technical Committee began its work in 1962; national contributions were submitted at the Paris May 1962 meeting by the following (P) Members of Subcommittee 2: France, Germany, Italy, United Kingdom, United States.

A synthesis of the various proposals was achieved and the resulting draft circulated for further discussions in October 1962.

After that meeting, Committee ISO/TC 97 circulated, for vote and comments, the first draft proposal [as contained in document ISO/TC 97/SC 2 (Secr. 12) 30 January 1963]. A majority (7 for, 3 against, and 2 not replying) was in favor of this draft proposal [see document ISO/TC 97/SC 2 (Secr. 14) 37].

During its October 1963 meeting, Subcommittee 2 considered the various comments received, and a second draft proposal [ISO/TC 97/SC 2 (Secr. 22) 75] embodied all the agreed amendments. Following Resolution 1 of this meeting, the second draft proposal was circulated for vote and comments among (P) and (O) Members of ISO/TC 97.

The result of this second letter ballot [as shown in document ISO/TC 97/SC 2 (Secr. 24) 77] was 11 for approval (Belgium, France, Germany, Italy, Japan, Poland, Spain, Sweden, Switzerland, United Kingdom, United States), none against. However, as most of the comments were of substance, document 75 was reconsidered at the New York meeting of ISO/TC 97/SC 2 (May, 11-15 1964).

The third draft proposal embodied all the amendments agreed upon during the May 1964 meeting.

The fourth ISO Draft proposal (as given in document ISO/TC 97/SC 2 (Secr. 37) 130, March 1965), drafted in order to incorporate some observations from the International Telegraph and Telephone Consultative Committee (CCITT), has been unanimously approved (with or without comment) by a vote within plenary Committee ISO/TC 97.

In accordance with Resolutions 6 and 7 taken by Committee ISO/TC 97 (Tokyo, October 1965) the comments received, particularly those from the CCITT, were examined at a joint ISO/CCITT meeting (Paris, April 1966). Taking action on Resolution 1 taken by Subcommittee ISO/TC 97/SC 2 (Paris, April 1966), the present Draft ISO Recommendation is submitted to the approval of every ISO Member Body.

Draft ISO Recommendation No. 1052

6 AND 7 BIT CODED CHARACTER SETS FOR INFORMATION PROCESSING INTERCHANGE

1. GENERAL

1.1 Purpose

1.1.1 This Recommendation defines two character sets for general usage, including letters, figures, punctuation marks, other symbols and controls, with their coded representation.

1.1.2 The requirements for graphics and controls in data handling and programming, in accordance with computer and ancillary equipment characteristics, have been taken into account in determining these character sets.

1.1.3 The Recommendation consists of two tables with notes, a legend, explanatory notes and the definitions of functional characteristics related to control characters.

1.2 Scope

1.2.1 These character sets are primarily intended for the interchange of information among data processing systems and associated equipment. They may be regarded as basic alphabets in the abstract sense.

1.2.2 These character sets are applicable to all so-called latin alphabets.

1.2.3 One character set contains 6-bit characters and provides 64 coded characters, the other contains 7-bit characters and provides 128 coded characters. The two sets are compatible in that they are logically related. This facilitates the conversion between the two sets.

1.3 Implementation

1.3.1 These character sets may be implemented in various media with logically related codes, as appropriate. For example, this could include punched tapes, punched cards, magnetic tapes and transmission channels, thus permitting interchange of data to take place either indirectly by means of an intermediate recording in a physical medium, or by local electrical connection of various units (such as input and output devices and computers) or by means of data transmission equipment.

1.3.2 It is the subject of other ISO Recommendations to describe the means of recording these character sets in physical media and the means of encoding them for transmission while taking into account the need for error checking *.

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* For the implementation of codes
- on punched tape, see Recommendation ISO/R... [Now, Draft proposal ISO/TC 97 (Secr. 78) 128, March 1966]
- on punched cards, see Recommendation ISO/R... [Now, Draft proposal ISO/TC 97/SC 2 (Secr. 65) 216, May 1966]
- on 7 and 9 track magnetic tapes, see Recommendations ISO/R... and ISO/R... [Now, Draft Recommendation ISO/TC 97/SC 2 (Secr. 66) 217, May 1966 and Draft proposal ISO/TC 97/SC 2 (Secr. 67) 218, May 1966.]

2.1 6-Bit set table

Bits						Column / Row		
b_6							0	
	b_5						0	
		b_4	b_3	b_2	b_1		0	
		0	0	0	0	0	SP	
		0	0	0	1	1	F_1 (HT)	
		0	0	1	0	2	F_2 (LF) ①)	
		0	0	1	1	3	F_3 (VT)	
		0	1	0	0	4	F_4 (FF)	
		0	1	0	1	5	F_5 (CR) ①)	
		0	1	1	0	6	SO	
		0	1	1	1	7	SI	
		1	0	0	0	8	(	
		1	0	0	1	9	)	
		1	0	1	0	10	*	
		1	0	1	1	11	+	
		1	1	0	0	12	,	<
		1	1	0	1	13	—	=
		1	1	1	0	14	.	>
		1	1	1	1	15	/	

① The controls CR and LF are intended for printer equipmen which requires separate combinations to return the carriage anc to feed a line.

For equipment which uses a single control for a combined carriag return and line feed operation.

- in the 6-bit set table, the function F_2 will have the meaning o "New Line" (NL). F_5 will then have the meaning of "Backspace" (BS);
- in the 7-bit set table, the function FE_2 will have the meaning of "New Line" (NL).

These substitutions require agreement between the sender and the recipient of the data.

The use of this function "NL" is not allowed for international transmission on general telecommunication networks (Telex and Telephone networks).

2.1 7-Bit set table

0	0	1	1	1	1
1	1	0	0	1	1
0	1	0	1	0	1
2	3	4	5	6	7
SP	0	@ ③)	P	④)	p
!	1	A	Q	a	q
" ⑥)	2	B	R	b	r
£ ②) ⑦)	3	C	S	c	s
$ ②)	4	D	T	d	t
%	5	E	U	e	u
&	6	F	V	f	v
' ⑥	7	G	W	g	w
(	8	H	X	h	x
)	9	I	Y	i	y
*	: ⑧)	J	Z	j	z
+	; ⑧)	K	([) ③)	k	③)
,	<	L	③)	l	③)
—	=	M	(]) ③)	m	③)
.	>	N	^ ④) ⑥)	n	— ④) ⑤)
/	?	O	_	o	DEL

⑦ In countries where there is no requirement for the symbol £ the symbol # may be used in position 2/3 of the 7-bit set table.

⑧ If 10 and 11 as single characters are needed (for example, for Sterling currency subdivision), they should take the place of "colon" (:) and "semi-colon" (;) respectively. These substitutions require agreement between the sender and the recipient of the data.

On the general telecommunication networks, the characters "colon" and "semi-colon" are the only ones authorized for international transmission.

⑨ Either of the two sets of three symbols shown in these positions in the table may be chosen; the interpretation of the corresponding combinations requires agreement between the sender and the recipient of the data.

3. LEGEND

3.1 Controls

ACK	ACKNOWLEDGE
BEL	BELL
BS	BACKSPACE
CAN	CANCEL
CR	CARRIAGE RETURN
DC	DEVICE CONTROL
DEL	DELETE
DLE	DATA LINK ESCAPE
EM	END OF MEDIUM
ENQ	ENQUIRY
EOT	END OF TRANSMISSION
ESC	ESCAPE
ETB	END OF TRANSMISSION BLOCK
ETX	END OF TEXT
F	FUNCTION
FE	FORMAT EFFECTOR
FF	FORM FEED
FS	FILE SEPARATOR
GS	GROUP SEPARATOR
HT	HORIZONTAL TABULATION
IS	INFORMATION SEPARATOR
LF	LINE FEED
NAK	NEGATIVE ACKNOWLEDGE
NL	NEW LINE
NUL	NULL
RS	RECORD SEPARATOR
SI	SHIFT-IN
SO	SHIFT-OUT
SOH	START OF HEADING
SP	SPACE
STX	START OF TEXT
SUB	SUBSTITUTE
SYN	SYNCHRONOUS IDLE
TC	TRANSMISSION CONTROL
US	UNIT SEPARATOR
VT	VERTICAL TABULATION

3.2 Graphical Symbols

Graphical Representation	Name	Position in the code tables *	
		6-bit	7-bit
(Space)	A normally non-printing graphic character	0/0	2/0
!	Exclamation mark	—	2/1
"	Quotation mark. Diaeresis (note (6))	—	2/2
£	Currency symbol £ (note (2))	3/12	2/3
$	Currency symbol $ (note (2))	1/12	2/4
%	Percent	1/13	2/5
&	Ampersand	1/14	2/6
'	Apostrophe, Acute accent (note (6))	1/15	2/7
(	Left parenthesis	0/8	2/8
)	Right parenthesis	0/9	2/9
*	Asterisk	0/10	2/10
+	Plus sign	0/11	2/11
,	Comma	0/12	2/12
—	Hyphen, minus sign	0/13	2/13
.	Full stop (period)	0/14	2/14
/	Solidus	0/15	2/15
:	Colon	1/10	3/10
;	Semi-colon	1/11	3/11
<	Less than	1/12	3/12
=	Equals	1/13	3/13
>	Greater than	1/14	3/14
?	Question mark	—	3/15
@	Commercial at	—	4/0
[	Left square bracket	3/11	5/11
]	Right square bracket	3/13	5/13
^	Upwards arrow, Circumflex accent (note (6))	—	5/14
_	Underline	—	5/15
	Grave accent	—	6/0
‾	Overline (note [5])	—	7/14

Notes [2] [5] [6] see pages 6-7.

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* See paragraph 4.1 page 10.

4. EXPLANATORY NOTES

4.1 Numbering of the positions in the code tables

Within any one character the bits are identified by b_7, b_6... b_1, where b_7 or b_6 is the highest order, or most significant bit, and b_1 is the lowest order, or least significant bit.

If desired these may be given a numerical significance in the binary system, thus:

Bit identification:	b_7	b_6	b_5	b_4	b_3	b_2	b_1
Significance:	64	32	16	8	4	2	1

In the code tables the columns and rows are identified by numbers written in binary and decimal notations.

Any one position in a code table may be identified either by its bit pattern, or by its column and row numbers. For instance, the position containing the figure 1 in the 7-bit set table may be identified:

— by its bit-pattern, e.g. 011 0001

— by its column and row numbers, e.g. 3/1.

4.2 Diacritical signs

In the 7-bit character set, some printing symbols may be designed to permit their use for the composition of accented letters when necessary for general interchange of information. A sequence of three characters, comprising a letter, " Backspace " and one of these symbols, is needed for this composition, and the symbol is then regarded as a diacritical sign. It should be noted that these symbols take on their diacritical significance only when they are preceded or followed by the " Backspace " character; for example, the symbol corresponding to the code combination 2/7 (') normally has the significance of " apostrophe ", but becomes the diacritical sign " acute accent " when preceded by the " Backspace " character.

In order to increase efficiency, it is possible to introduce accented letters (as single characters) in the positions marked by note ③ in the code tables. According to national requirements, these positions may contain special diacritical signs.

5. FUNCTIONAL CHARACTERISTICS RELATED TO CONTROL CHARACTERS

Some definitions in this section are stated in general terms and more explicit definitions of use may be needed for specific implementation of the code tables. These more explicit definitions may become the subject of other Recommendations.

A control character may be identified by a general designation, by a specific designation or by a combination of both.

5.1 General designations of control characters

The general designations of control characters involve a specific name followed by a subscript number.

They are defined as follows:

TC TRANSMISSION CONTROL

A functional character intended to control or facilitate transmission of information over telecommunication networks.

The use of the TC characters on the general telecommunication networks may be the subject of future Recommendations.

FE FORMAT EFFECTOR

A functional character which controls the layout or positioning of information in Input/Output media.

DC DEVICE CONTROL

A functional character for the control of an ancillary device associated with a data processing or telecommunication system, more especially an " On " or " Off " switching device.

The following is an example of how device control characters could be used in a specific tape system employing two ancillary tape punches and one ancillary tape reader:

DC_1 — First Punch " On "
DC_2 — Second Punch " On "
DC_3 — Tape reader " On "

The DC_4 character has a specific function, defined in paragraph 5.2 page 12.

IS INFORMATION SEPARATOR

A functional character which is used to separate and qualify information blocks in a logical sense. There is a group of four such characters, which are intended to be used in a hierarchical order.

F FUNCTION

A functional character in the 6-bit set, which may have the combined or alternative meanings of IS or FE.

Control characters with a general designation FE, IS and F have a specific designation. These appear next to them, in parentheses, in the code tables. These specific designations, the definitions of which are given in paragraph 5.2, have been chosen from the terminology used for some types of equipment. In other types of equipment, different but related meanings may be associated with certain of these control characters, but this requires agreement between the sender and the recipient of the data.

5.2 Specific designations of control characters

These are defined as follows:

ACK	ACKNOWLEDGE A Transmission Control character transmitted by a receiver as an affirmative response to a sender.
BEL	BELL A character for use when there is a need to call for human attention; it may control alarm or attention devices.
BS	BACKSPACE A layout character which controls the movement of the printing position one printing space backward on the same printing line.
CAN	CANCEL A character used to indicate that the information it accompanies is in error.
CR	CARRIAGE RETURN A layout character which controls the movement of the printing position to the first printing position on the same printing line.
DC 4	A Device Control character used to interrupt or turn off ancillary devices (STOP).
DEL	DELETE This character is used primarily to erase or obliterate erroneous or unwanted characters in punched tape. DEL characters may be inserted into or removed from a stream of data without affecting the information content of that stream. DEL characters may serve to accomplish media-fill or time-fill but then the addition or removal of these characters may affect the information layout and/or the control of equipment.
DLE	DATA LINK ESCAPE A Transmission Control character which will change the meaning of a limited number of contiguously following characters. It is used exclusively to provide supplementary data transmission control functions. Only graphics and Transmission Control characters can be used in DLE sequences.
EM	END OF MEDIUM A control character which may be used to identify the physical end of the medium, or the end of the used, or wanted, portion of information recorded on a medium. The position of this character does not necessarily correspond to the physical end of the medium.

ENQ ENQUIRY

A Transmission Control character used as a request for a response from a remote station—the response may include station identification and/or station status. When a " Who are you " function is required on the general switched transmission network, the first use of ENQ after the connection is established shall have the meaning " Who are you " (station identification). Subsequent use of ENQ may, or may not, include the function " Who are you ", as determined by agreement.

EOT END OF TRANSMISSION

A Transmission Control character used to indicate the conclusion of the transmission of one or more texts.

ESC ESCAPE

A functional character which may be used to extend the standard character set of the code table. It is a warning or non-locking shift character which changes the meaning of the next single following code combination. The precise meaning of the character following Escape requires prior agreement between the sender and the recipient of the data. Where required the character following Escape may extend the Escape sequence.

Escape sequences are used primarily to obtain additional control functions which may provide amongst other things graphics or graphic sets outside the standard set. Such control functions must not be used as additional Transmission Controls.

Null and Delete and the ten Transmission Controls must not be used in defining Escape sequences. Where they appear in an actual Escape sequence they shall retain their standard meaning and be disregarded in the interpretation of the Escape sequence.

The use of certain Escape sequences will be the subject of further Recommendations.

ETB END OF TRANSMISSION BLOCK

A Transmission Control character used to indicate the end of a transmission block of data where data is divided into such blocks for transmission purposes.

ETX END OF TEXT

A Transmission Control character which terminates a text.

FF FORM FEED

A layout character which controls the movement of the printing position to the first predetermined printing line on the next form.

FS FILE SEPARATOR

See Unit Separator (US) for definition.

GS GROUP SEPARATOR

See Unit Separator (US) for definition.

HT Horizontal Tabulation

A layout character which controls the movement of the printing position to the next in a series of predetermined positions along the printing line.

LF Line Feed

A layout character which controls the movement of the printing position to the next printing line.

NAK Negative Acknowledge

A Transmission Control character transmitted by a receiver as a negative response to the sender.

NL New Line

A layout character which controls the movement of the printing position to the first printing position of the next printing line.

NUL Null

A character whose sole purpose is to accomplish media-fill or time-fill. NUL characters may be inserted into or removed from a stream of data without affecting the information content but then the information layout and/or the control of equipment may be affected.

RS Record Separator

See Unit Separator (US) for definition.

SI Shift-in

The shift-in character means that the code combinations which follow shall be interpreted according to the standard code table.

SO Shift-out

The shift-out character means that the code combinations which follow shall be interpreted as outside of the standard code table until a shift-in character is reached. However, all the control characters (columns 0 and 1 the 7-bit code table) and Delete will retain their standard interpretation. The shift-out character is reserved primarily for extension to the graphics.

SOH Start of Heading

A Transmission Control character used as the first character of a heading of an information message.

SP Space

A normally non-printing graphic character used to separate words. It is also a layout character which controls the movement of the printing position, one printing position forwards.

STX Start of Text

A Transmission Control character which precedes a text and which is used to terminate a heading.

SUB SUBSTITUTE

A Substitute character used to replace a character which is determined to be invalid or in error.

SYN SYNCHRONOUS IDLE

A Transmission Control character used by a synchronous transmission system in the absence of any other character (idle condition) to provide a signal from which synchronism may be achieved or retained between data terminal equipments.

US UNIT SEPARATOR

Terminates an information block called a UNIT. Similarly, RECORD SEPARATOR (RS), GROUP SEPARATOR (GS), FILE SEPARATOR (FS) terminate information blocks called RECORD, GROUP, FILE, respectively.

The four information separators are in the hierarchical ascending order US, RS, GS, FS.

An information block must not be split by high order separator; e.g. a record may contain a whole number of " units ", but may not contain a part of a " unit ".

VT VERTICAL TABULATION

A layout character which controls the movement of the printing position to the next in a series of predetermined printing lines.

ISO/TC 97 (Secretariat - 91) 142 E
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It was, therefore, decided to hold up the ISO approval procedure for the time being and to call a joint meeting of ISO/TC 97/SC 2 - CCITT/GM ALP. This meeting was held in Paris in April 1966 and led to completion of a fifth draft proposal.

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June 1, 1966

Subject: American Standard Code for
Information Interchange (ASCII)

As a result of recent international and domestic agreements, a few changes will shortly be made in the American Standard Code for Information Interchange (ASCII). It is expected that the Teletype Corporation product line will be modified to conform to these changes.

A brief historical review of the development of the code shows that the existing ASCII was published on June 17, 1963 (American Standards document X3.4-1963); Attachment A is the code table from that Standard. In 1963 and 1964 code development work in the United States, as well as in the ISO (International Organization for Standardization) and CCITT (Comite Consultatif International Telegraphique et Telephonique), resulted in nearly complete agreement on certain revisions to the code. A proposed American Standard, represented by Attachment B and conforming to the CCITT version of the code, was approved by the American Standards Association in 1965. It is this version of the code upon which Model 37 development has been based.

In Tokyo last October a joint meeting of ISO Committee TC 97/SC 2 and CCITT Working Party-ALPHABET was proposed to resolve the few remaining differences in the positions of these two groups. Printing and distribution of the revised American Standard were delayed pending the results of this joint meeting.

At the joint meeting held in Paris, April 25 through 29, final changes to provide identical ISO and CCITT code alphabets were unanimously agreed upon.

At its meeting in Washington, D.C., on May 19, the American Standards Association's Subcommittee X3.2 approved revisions of the ASCII necessary to achieve conformance with the Paris results. In addition, certain national choice options were exercised. The revised code table is attached as Attachment C.* It is expected this code table will receive final approval as an American Standard in the next few months.

The Bell Telephone Laboratories have informed us, informally, that the Bell System will adopt the ASCII Code Table, Attachment C, and that a memorandum will be generated, superseding Mr. T. J. Woosnam's memorandum of April 11, 1966, "Subject: 4-Row Keyboard, 8-Level Teletypewriters - ASCII Changes and Associated Machine Improvements - Case 39065." This decision is based on the almost certain acceptance of this latest revision of the ASCII.

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*For reference purposes, this revision of ASCII will probably be identified as ASA X3.4-1966.

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As a result of the above actions, the ASCII Code Table, Attachment C, will be a design standard for the Teletype Corporation. Product conformance should be as expeditious as possible, as directed by responsible line organizations. Care should be taken to coordinate the changes with our customers.

Attachment D shows the effect of these changes on certain Model 33, 35 and 37 Sets, while Attachment E summarizes all the differences between the three ASCII code versions.

JBBooth
J. B. BOOTH - 9140

J. F. AUWAERTER - 9400

Att.

ATTACHMENT D

CHANGES IN MODELS 33 AND 35

Most of the developments in the ASCII over the past three years have affected areas not implemented in the Model 33 and Model 35 Sets or have involved changes in nomenclature only. The table below shows the changes which will be required in presently manufactured Model 33 and 35 Sets.

1. ↑ becomes ^
2. ← becomes _
3. Early units had "Escape" (sometimes labeled ALT MODE) coded as permutation 7/13 or 7/14; Escape is now 1/11. Sets built in the past year have "Escape" properly coded.

CHANGES IN MODEL 37

The Model 37 Sets delivered to date would require the following changes to reflect the change from X3.4-1965 to X3.4-1966.

1. ` becomes @
2. @ becomes `
3. ~ becomes \
4. ¬ becomes |
5. | becomes ¬

ASCII COMPARISON TABLE

Code Chart Column/Row	X3.4-1963	X3.4-1965	X3.4-1966	Type of Control Change S = Substantive	N = Nomenclature
0/0	NULL	NUL	Same as X3.4-1965		N
0/1	SOM	SOH	" " " "		N
0/2	EOA	STX	" " " "		N
0/3	EOM	ETX	" " " "		N
0/5	WRU	ENQ	" " " "		N
0/6	RU	ACK	" " " "	S	
0/7	BELL	BEL	" " " "		N
0/8	FE_0	BS	" " " "	S	
0/9	HT/SK	HT	" " " "		N
0/11	VTAB	VT	" " " "		N
1/0	DC_0	DLE	" " " "	S	
1/4	DC_4(STOP)	DC_4	" " " "		N
1/5	ERR	NAK	" " " "	S	
1/6	SYNC	SYN	" " " "		N
1/7	LEM	ETB	" " " "	S	
1/8	S_0	CAN	" " " "	S	
1/9	S_1	EM	" " " "	S	
1/10	S_2	SS	SUB	S	
1/11	S_3	ESC	Same as X3.4-1965	S	
1/12	S_4	FS	" " " "		N
1/13	S_5	GS	" " " "		N
1/14	S_6	RS	" " " "		N
1/15	S_7	US	" " " "		N
2/0	ƀ	SP	" " " "		N
4/0	@	`	" " X3.4-1963		
5/12	\	~	" " " "		
5/14	↑	^	" " X3.4-1965		
5/15	←	_	" " " "		
6/0	Unassigned	@	`		
6/1 - 7/10	Unassigned	a through z	Same as X3.4-1965		
7/11	Unassigned	{	" " " "		
7/12	ACK	¬	|		
7/13	Unassigned	}	Same as X3.4-1965		
7/14	ESC	|	¬		

ATTACHMENT E